CHAPTER 9 Troubleshooting

Overview

IMPORTANT In addition to the information stated, never disassemble the instrument or have it repaired by unauthorized personnel. Beckman Coulter bears no responsibility for any problems arising from the unauthorized repair of the instrument.

This chapter introduces solutions to common problems. If there is a problem, follow the information in this chapter to carry out self-inspection. If the problem cannot be resolved, contact us.

This chapter contains information on:

- Laser Related Hazards
- Hazard Labels and Locations
- Disposal Precaution
- Troubleshooting Table

Laser Related Hazards

Beckman Coulter design and manufacture of the instrument complies with the requirements governing the use and application of a laser specified in regulatory documents issued by the:

- U.S. Department of Health and Human Services
- Center for Devices and Radiological Health (CDRH)
- International Electrotechnical Commission (IEC)

In compliance with these regulatory documents, every measure has been taken to ensure the health and safety of users and laboratory personnel from the possible dangers of laser use.

Use the instrument according to the information in the manuals.

Use controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

To ensure your safety, the lasers are covered with protective shields. Do not remove these shields.

No user-serviceable assemblies are accessible. Do not attempt to remove the laser or open it. The instrument has components that are dangerous to the operator. If any attempt has been made to defeat a safety feature, or if the instrument fails to perform as described in its manuals, disconnect the power and contact us.

Laser Beam Hazards

The CytoFLEX SRT instrument contains 4 solid-state diode lasers that are capable of producing laser light at the following levels:

- 405-nm, 90-mW solid-state diode laser
- 488-nm, 50-mW solid-state diode laser
- 561-nm, 30-mW solid-state diode laser
- 638-nm, 100-mW solid-state diode laser

A laser beam is a unique light source that shows characteristics different from conventional light sources. The safe use of the laser depends upon familiarity with the instrument and the properties of coherent, intense beams of light.



Risk of personal injury. The laser beam can cause eye damage if viewed either directly or indirectly from reflective surfaces (such as a mirror or shiny metallic surfaces). To prevent eye damage, avoid direct exposure to the laser beam. Do not view it directly or with optical instruments.

The laser beam can cause eye or skin damage, as well as instrument damage. The laser has enough power to ignite substances place in the beam path, even at a distance. Indirect contact with the laser beam from reflective surfaces (such as jewelry or a screwdriver) is called specular reflection and might also cause damage.

For these reasons, use the following precautions when working near an exposed laser:

- Never look directly into the laser light source or at scattered laser light from any reflective surface. Never look down the beam into the source.
- As a precaution against accidental exposure to the output beam or its reflection, wear proper laser safety glasses (as required by the wavelength being used) when performing service or maintenance procedures on the system.
- Do not use lasers in the presence of flammable material or explosives; these include volatile substances such as alcohol, solvents, and ether.
- Avoid direct exposure and indirect reflection of the laser beam to your skin. The intensity of the beam can cause flesh burns.
- Assure that any spectators are not potentially exposed to a hazardous condition.
- Do not leave the laser unattended if there is a chance that an unauthorized person may try to use it.
- Make the following recommendations to the laboratory:
 - Limit access to the instrument. Keep the instrument out of hands of inexperienced and untrained personnel.
 - Never attempt to remove a shield housing a laser.
 - Post warning signs at the site to alert personnel that lasers are being used.
 - Never remove a warning label from the instrument.
 - Contact us if a label is missing or unclear.

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Laser Warning Labels



Risk of personal injury from radiation exposure. Never remove the shield surrounding a laser. Never remove covers.

CDRH-approved and IEC compliant labels are also placed near or on those covers that when removed might expose laser radiation. If necessary, a cover with a CDRH-approved or IEC compliant label must be removed by a qualified Beckman Coulter Representative only.

Refer to the following figures for the locations of the CDRH-approved and IEC compliant labels:

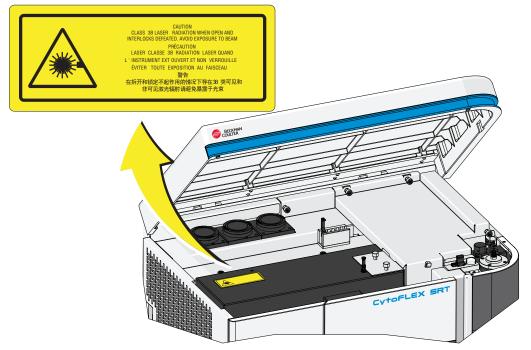
Refer to Figure 9.1 for the Laser Warning Label on the Sorter optical bench.

Refer to Figure 9.2 for the Laser Warning Label on the optical bench (located Inside the Sorter).

Refer to Figure 9.3 for the Laser Warning Labels on the Sorter Back Cover.

The laser product is classified as CLASS 1 when all protective measures are in place. This product complies with 21 CFR Parts 1040.10 and 1040.11 as well as EN60825-1. Refer to Figure 9.1.

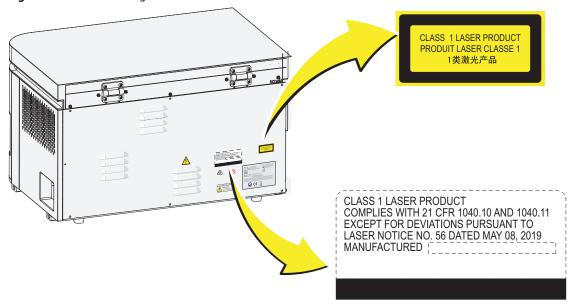
Figure 9.1 Laser Warning Label on the Laser Optical Bench



LASER RADIATION
AVOID EXPOSURE TO BEAM
CLASS 3B LASER PRODUCT
激光辐射
清避免暴露于光束
3B类激光产品

Figure 9.2 Laser Warning Label within the Optical Bench (Located Inside the Sorter)

Figure 9.3 Laser Warning Labels on the Sorter Back Cover



Hazard Labels and Locations

Carefully read the hazard warning labels on the instrument. The hazard labels are located on the instrument as indicated.

NOTE If a label is missing or unclear, contact us.

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Biohazard Label and Location

Figure 9.4 Biohazard Label on the Fluidics Cart and Waste Container

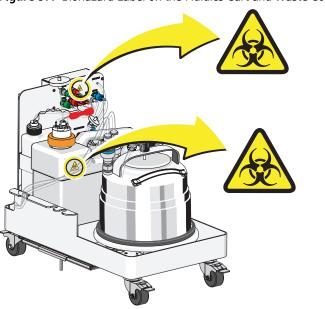
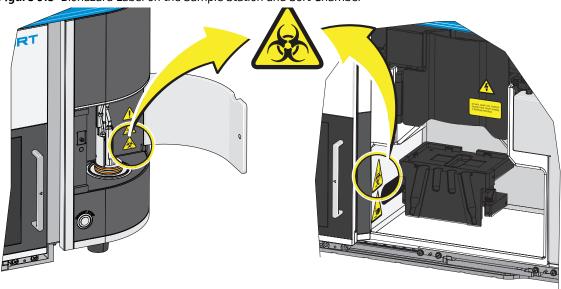
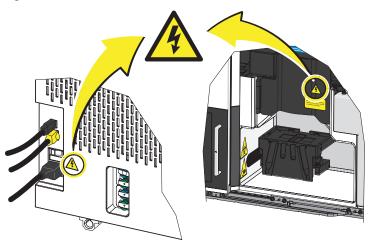


Figure 9.5 Biohazard Label on the Sample Station and Sort Chamber



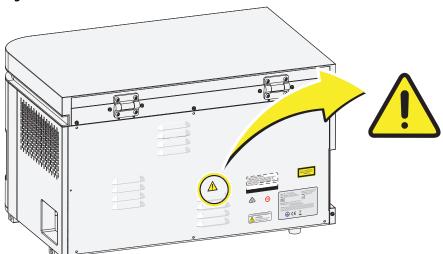
Electrical Shock Hazard Label and Location

Figure 9.6 Electrical Shock Hazard Label



Caution Labels and Location

Figure 9.7 Caution Label on the Sorter Back Cover



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Figure 9.8 Label on the Sort Protection Door

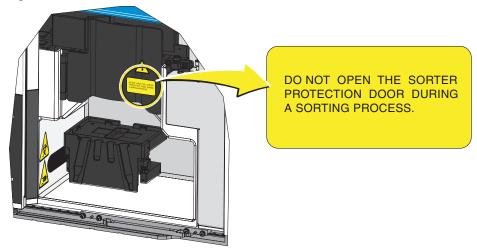
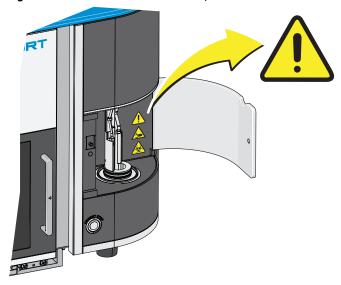


Figure 9.9 Caution Label on the Sample Station



Pinch Hazard Labels and Location

Figure 9.10 Pinch Hazard Label on the Sample Station

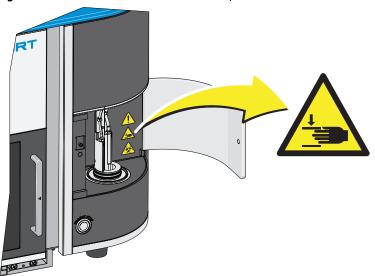
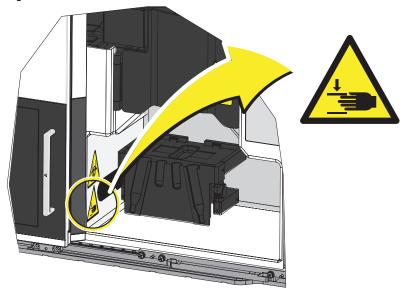


Figure 9.11 Pinch Hazard Label on the Sort Chamber



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Disposal Precaution





WARNING

Risk of biohazardous contamination if you have skin contact with the waste container, its contents, and its associated tubing. The waste container and its associated tubing could contain residual biological material and must be handled with care. Clean up spills immediately. Dispose of the contents of the waste container in accordance with your local regulations and acceptable laboratory procedures.

Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.

Troubleshooting Table

Table 9.1 and Table 9.2 list problems that you could encounter while running the Sorter, the probable causes of each problem, and the corrective actions. These problems are listed alphabetically in the Index, under the primary entry "troubleshooting."

 Table 9.1 Troubleshooting-[Error Codes]

Problem	Probable Cause	Corrective Action
[Error code 010037] Bubble detector error.	 The silicone tubing is not completely seated in the slot of the sample line bubble detector. Tube holder contains water. The sample probe height is not accurate. The bubble detector is defective. Bubble Detector Calibration is not run after replacing the sample line. 	 Verify that the joint between the silicone tubing and the PEEK tubing is completely in the slot of bubble detector. Refer to Steps19 -21 in Replacing the Sample Line. Verify that the tube holder is clean and dry. Verify that the sample probe height is accurate. Refer to Steps 10 - 14 in CHAPTER 11, Replacement/ Adjustment Procedures. Calibrate the bubble detector again. Refer to Calibrating the Sample Line Bubble Detector. If the problem persists, contact us.
[Error code 060048] Failed to set the charge phase. No droplet is detected.	 The fluid stream is unstable. The side stream illumination is defective or not installed. The charge drive board is defective. The acquisition circuit board is defective. The photodiodes are defective. High-voltage components are broken. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Clean the side stream illumination source. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060049] The charge phase value is out of range.	 The fluid stream is unstable. The photodiodes are defective. The charge drive board is defective. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures.
		3. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures.
		 Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures.
		5. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures.
		6. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures.
		7. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures.
		8. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures.
		9. Wipe the side stream detection window. Refer to Figure 1.23.
		10. Verify that the nozzle lift is clean and dry. Refer to Steps 4 - 6 in CHAPTER 10, Cleaning Procedures.
-		11. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060050] Failed to set the charge voltage of R1 stream.	 The fluid stream is unstable. The photodiodes are defective. The charging drive board is defective. Electric leakage of high-voltage component. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures.
		 Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/
		 Adjustment Procedures. 5. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures.
		 Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Wipe the side stream detection window. Refer to Figure 1.23
		 Figure 1.23. 9. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures.
		10. Verify that the nozzle lift is clean and dry. Refer to Steps 4 - 6 in CHAPTER 10, Cleaning Procedures.11. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060051] Charge phase verification failed.	 The fluid stream is unstable. The photodiodes are defective. The charging drive board is defective. Electric leakage of high-voltage component. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures.
		 Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/
		 Adjustment Procedures. 5. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. 6. Run Daily Clean. Refer to Daily Clean Program in
		 CHAPTER 10, Cleaning Procedures. 7. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. 8. Clean the side stream illumination and the deflection
		plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. 9. Wipe the side stream detection window. Refer to Figure 1.23.
		 10. Verify that the nozzle lift is clean and dry. Refer to Steps 4 - 6 in CHAPTER 10, Cleaning Procedures. 11. Verify that the ambient temperature in the lab is within the range (15-27 °C), and the fluctuation is within < ±2 °C. Use appropriate air condition if necessary. 12. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060052] Charge phase optimization failed.		 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures.
		3. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. 4. Run Flow Call Debubble. Refer to Reference the
		 Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures.
		5. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures.
		6. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures.
		7. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures.
		8. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures.
		9. Wipe the side stream detection window. Refer to Figure 1.23.
		10. Verify that the nozzle lift is clean and dry. Refer to Steps 4 - 6 in CHAPTER 10, Cleaning Procedures.
		11. Verify that the ambient temperature in the lab is within the range (15-27 °C), and the fluctuation is within $< \pm 2$ °C. Use appropriate air condition if necessary.
		12. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition.
		13. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting.
		14. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060053] The charge voltage of L2 stream is out of range. [Error code 060054] The charge voltage of L1 stream is out of range. [Error code 060056] The charge voltage of R1 stream is out of range. [Error code 060057] The charge voltage of R2 stream is out of range.	 The fluid stream is unstable. The photodiodes are defective. Airflow interference. Electric leakage of high-voltage component. Leakage of the fluidics system. The narrow slot mask of the PD is partly or completely blocked. The core stream or the side stream Hardware is not straight enough. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Wipe the side stream detection window. Refer to Figure 1.23. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Verify that the nozzle lift is clean and dry. Refer to Steps 4 - 6 in CHAPTER 10, Cleaning Procedures. Verify that the ambient temperature in the lab is stable and within the range (15-27 °C), and the fluctuation is within < ±2 °C. Use appropriate air condition if necessary. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060058] Failed to optimize the charge voltage for L2 stream. [Error code 060059] Failed to optimize the charge voltage for L1 stream. [Error code 060060] Failed to optimize the charge voltage for R1 stream. [Error code 060061] Failed to optimize the charge voltage for R2 stream. [Error code 060062] Failed to optimize the charge voltage for central stream.	 The fluid stream is unstable. The photodiodes are defective. Airflow interference. Electric leakage of high-voltage component. Leakage of the fluidics system. The narrow slot mask of the PD is partly or completely blocked. The core stream or the side stream Hardware is not straight enough. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Wipe the side stream detection window. Refer to Figure 1.23. Verify that the nozzle lift is clean and dry. Refer to Steps 4 - 6 in CHAPTER 10, Cleaning Procedures. Ensure that the ambient temperature in the lab is stable and within the range (15-27 °C), and the fluctuation is within < ±2 °C. Use appropriate air condition if necessary. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060063] Failed to determine the Detector Delay for L2 stream. [Error code 060064] Failed to determine the Detector Delay for L1 stream. [Error code 060065] Failed to determine the Detector Delay for R1 stream. [Error code 060066] Failed to determine the Detector Delay for R2 stream. [Error code 060067] Failed to determine the Detector Delay for Gap detector. [Error code 060068] Failed to determine the Detector Delay for Central stream.	 The fluid stream is unstable. The photodiodes are defective. Airflow interference. Electric leakage of high-voltage component. Leakage of the fluidics system. The narrow slot mask of the PD is partly or completely blocked. The core stream or the side stream module is not aligned. 	 Select Standby to turn off the sheath. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Wipe the side stream detection window. Refer to Figure 1.23. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. Restart the system. Refer to CHAPTER 3, Daily Startup. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060069] Scan defanning value error.	The fluid stream is unstable. The photodiodes are defective. Airflow interference.	 Select Standby to turn off the sheath. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Wipe the side stream detection window. Refer to Figure 1.23. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060070] The Central stream is not tight.	The fluid stream is unstable.The photodiodes are defective.Airflow interference.	 Select Standby to turn off the sheath. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures.
		3. Wipe the side stream detection window. Refer to Figure 1.23.
		 Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures.
		 If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures.
		 If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures.
		5. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures.
		6. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures.
		7. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures.
		8. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures.
		9. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures.
		10. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition.
		11. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting.
		12. Restart the system. Refer to CHAPTER 3, Daily Startup.
		13. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
Problem [Error code 060075] The defanning value is out of range.	The fluid stream is unstable. The photodiodes are defective. Airflow interference.	 Select Standby to turn off the sheath. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Wipe the side stream detection window. Refer to Figure 1.23. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition. Rerun Sort Calibration. Refer to Sort Calibration
		Program in CHAPTER 10, Cleaning Procedures. 10. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 060093] The central stream is not aligned with the detectors.	 The fluid stream is unstable. The photodiodes are defective. The nozzle is clogged or damaged. Air bubbles are in the system. Airflow interference. Leakage of the fluidics system. Electric leakage of high-voltage components. The narrow slot mask of the PD is partly or completely blocked. The side stream detector or gap detector are not aligned with the core stream. 	 Select Standby to turn off the sheath. Wipe the side stream detection window. Refer to Figure 1.23. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 070004] No stream is detected.	 The camera USB cable is not securely connected. Some quick connectors for the sheath line are not securely connected. The clogged nozzle blocks the fluid stream. The O-ring is missing or damaged. Air bubbles get into the sheath filter, or flow cell. The fluid leaks around the nozzle. The abnormal sheath pressure causes the break-off point to descend. The sheath tank gets moved. The fluid stream is not in the center of camera view after the nozzle is replaced. The stream camera does not work properly. The strobe LED is defective. 	 Select Standby to turn off the sheath. Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. Verify that the quick connectors on the sheath tank, the fluidics cart, and the Sorter are securely connected. Refer to Figure 1.6, Figure 1.8, Figure 1.11. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Restart the system. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 070005] The stream is unstable.	 Air bubbles get into the sheath filter, and/or flow cell. The nozzle is clogged. Others 	 Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Backflush. Select Cytometer > Backflush. Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Restart the system. If the problem persists, contact us.
[Error code 070006] The break- off point is too low.	 Air bubbles get into the sheath filter, or flow cell. The nozzle is clogged. Others 	 Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. Or Manually set the Amplitude and Frequency to adjust the break-off position. Refer to Or perform Manual Droplet Calibration. in CHAPTER 5, Sorting. Restart the system. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 070007] Failed to apply the algorithm to maintain the drop delay.	 The nozzle is clogged. The O-ring is missing or damaged. Air bubbles get into the sheath filter, sample line, or flow cell. Others. 	 Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Backflush. Select Cytometer > Backflush. Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Restart the system.
[Error code 070008] The break-off point is too high.	 Air bubbles are in the sheath filter and/or flow cell. The O-ring is damaged. Others. 	 If the problem persists, contact us. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Backflush. Select Cytometer > Backflush. Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. Restart the system. Refer to CHAPTER 3, Daily Startup. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 070011] The image quality is poor.	 The camera USB cable is not connected securely. The surface of camera lens is dirty. The surface of strobe LED is dirty. The camera exposure time is set improperly. The stream camera does not work. The strobe LED is off. Others 	 Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. Restart the system. Refer to CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 070012] Nozzle check failed.	 The nozzle is clogged. The fluid leaks around the nozzle. Air bubbles get in the sheath line, sample line, and/or flow cell. The nozzle module is not installed. The strobe LED is off. The nozzle lift is wet. No stream. The camera USB cable is not connected securely. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Unplug the nozzle lift, and wipe it clean. Refer to Daily Decontamination During Shutdown in CHAPTER 10, Cleaning Procedures. Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Probable Cause	Corrective Action
 The nozzle is partially clogged or damaged. Air bubbles get in the sheath line, sample line, and/or flow cell. The sample contains aggregates or clumps. Unstable sheath fluid. Unexpected vibration or air flow interference. Others 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Filter the sample using an appropriately sized mesh aperture filter. Replace the sample line. Refer to Replacing the Sample Line in CHAPTER 11, Replacement/Adjustment Procedures. Rerun QC. Refer to Quality Control in CHAPTER 4, Instrument Quality Control and Standardization. Rerun Sort Calibration. Refer to Sort Calibration
	 The nozzle is partially clogged or damaged. Air bubbles get in the sheath line, sample line, and/or flow cell. The sample contains aggregates or clumps. Unstable sheath fluid. Unexpected vibration or air flow interference.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 070015] The satellite droplets are not merged into the main droplets.	 The nozzle is clogged. Air bubbles get in the sheath line, sample line, and/or flow cell. The O-ring is damaged. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures.
		 Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. If the problem persists, contact us.
[Error code 070016] The auto maintain function does not work properly.	The fluid stream is unstable.	 Rerun QC. Refer to Quality Control in CHAPTER 4, Instrument Quality Control and Standardization. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. Verify that the ambient temperature in the lab is within the range (15-27 °C), and the fluctuation is within < ±2 °C. Use appropriate air condition if necessary. If the problem persists, contact us.
[Error code 070017] The auto maintain function does not work properly.	The fluid stream is unstable.	 Rerun QC. Refer to Quality Control in CHAPTER 4, Instrument Quality Control and Standardization. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. Verify that the ambient temperature in the lab is within the range (15-27 °C), and the fluctuation is within < ±2 °C. Use appropriate air condition if necessary. If the problem persists, contact us.
[Error code 070018] The camera does not work properly.	The camera USB cable is not connected securely. others	 Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 070030] The break- off point is too high or too low to optimize the frequency setting.	 Air bubbles get in the sheath line, sample line, and/or flow cell. The nozzle is clogged. The flow cell is clogged. The camera USB cable is not securely connected. The stream camera is defective. The strobe LED does not work. 	 Verify that the quick connectors on the sheath tank, the fluidics cart, and the Sorter are securely connected. Refer to Figure 1.6, Figure 1.8, Figure 1.11. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. Restart the system. Refer to CHAPTER 3, Daily Startup. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 070031] Failed to determine the drop delay value due to the low break-off point.	 Air bubbles get in the sheath line, sample line, and/or flow cell. The nozzle is clogged. The flow cell is clogged. The sort drive board is defective. The Piezo does not work properly. 	 Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Rerun Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. Restart the system. Refer to CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 070033] The DD laser beam spot position is wrong.	 Air bubbles get in the sheath line, sample line, and/or flow cell. The nozzle is clogged. 	 Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 080030] Stream error.	 The nozzle is clogged. The fluid leaks around the nozzle. Air bubbles get in the sheath line, sample line, and/or flow cell. The nozzle module is not installed properly. The camera USB cable is not securely connected. The strobe LED is defective. The charging plate gets wet. The nozzle lift is wet. No stream. 	 Select Standby to turn off the sheath. Verify that the quick connectors on the sheath tank, the fluidics cart, and the Sorter are securely connected. Refer to Figure 1.6, Figure 1.8, Figure 1.11. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures Unplug the nozzle lift, and wipe it clean. Refer to Daily Decontamination During Shutdown in CHAPTER 10, Cleaning Procedures. Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 080031] Waste Container is full.	The waste container is nearly full. The waste float sensor is restricted.	 Empty the waste container. Refer to Emptying the Waste Container in CHAPTER 11, Replacement/ Adjustment Procedures. Verify that the float of the sensor in the waste container moves freely. If the problem persists, contact us.
[Error code 080032] Lack of sheath fluid.	The sheath tank is nearly empty. The sheath tank scale does not work properly.	 Refill the sheath tank. Refer to Filling the Sheath Tank in CHAPTER 11, Replacement/Adjustment Procedures. Recalibrate the sheath tank scale. Refer to Resetting the Sheath Tank Scale in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.
[Error code 080067] The sort protection door is open.	The sort protection door is opened when the sorting or sort calibration is in process.	 Verify that the sort protection door is closed. Refer to Figure 1.21. If the problem persists, contact us.
[Error code 080071] Cyclone moves out of the boundary.	 The motor X exceeds the left limit. The position of the limitation sensor in X-axis is wrong. The limitation sensor is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 080072] Cyclone moves out of the boundary.	 The motor X exceeds the right limit. The position of the limitation sensor in X-axis is wrong. The limitation sensor is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.
[Error code 080073] Cyclone moves out of the boundary.	 The motor Y exceeds the forward limit. The position of the limitation sensor in Y-axis is wrong. The limitation sensor is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.
[Error code 080074] Cyclone moves out of the boundary.	 The motor Y exceeds the backward limit. The position of the limitation sensor in the Y-axis is wrong. The limitation sensor is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.
[Error code 080075] Cyclone overcurrent status detected.	 The motor X is overcurrent. The Cyclone movement in X-axis is blocked by an obstacle inside the sort chamber. The sort drive board is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.
[Error code 080076] Cyclone overcurrent status detected.	 The motor Y is overcurrent. The Cyclone movement in Y-axis is blocked by an obstacle inside the sort chamber. The sort drive board is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.
[Error code 080077] Cyclone movement motor lost steps.	 The Cyclone movement in X-axis is blocked by an obstacle inside the sort chamber. The Cyclone module is defective. The sort drive board is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.
[Error code 080078] Cyclone lost steps.	 The Cyclone movement in Y-axis is blocked by an obstacle inside the sort chamber. The Cyclone module is defective. The sort drive board is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.
[Error code 080085] Failed to reset Cyclone.	 The Cyclone movement in X-axis is blocked by an obstacle inside the sort chamber. The sort drive board is defective. The position of the coupling block in X-axis is wrong. The Cyclone module is defective. 	 Verify that the sort chamber is clear of obstacles. Reset Cyclone. Select Sorting > Reset Cyclone. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 080086] Failed to reset Cyclone.	 The Cyclone movement in Y-axis is blocked by an obstacle inside the sort chamber. The sort drive board is defective. The position of the coupling block in Y-axis is wrong. The Cyclone module is defective. 	 Verify that the sort chamber is clear of obstacles. Select Reset Cyclone from the Sorting menu to reset Cyclone. If the problem persists, contact us.
[Error code 080087] High voltage arc detected.	The deflection plates might be wet.	 Verify that the deflection plates are clean and dry. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures If the problem persists, contact us.
[Error code 080088] Failed to maintain the drop delay.	 The nozzle is partially clogged or damaged. Air bubbles in the sheath line, flow cell or nozzle. Air leaks including sheath tank, sheath air filter. Unstable sheath fluid. Ventilation fan is defective. The fluctuation of ambient temperature is out of range. Unexpected air flow or vibration interference. 	 Select Standby to turn off the sheath. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Verify that the ambient temperature in the lab is within range (15-27 °C). Use appropriate air condition if necessary. Verify that the Sorter is not exposed directly to a ventilation outlet of an air condition. [With Biosafety Cabinet]: Verify that Biosafety Cabinet is turned on and the air flow is set properly. [With Biosafety Cabinet]: Verify that the view screen of Biosafety is open at a proper position. Ensure that the Sorter is placed on a smooth and solid surface. Restart the system. Refer to CHAPTER 3, Daily Startup. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 080089] High CPU temperature.	The ambient temperature is too high.	 Verify that the ambient temperature in the lab is within range (15-27 °C). Use appropriate air condition if necessary. [With Biosafety Cabinet]: Verify that Biosafety Cabinet is turned on and the air flow is set properly. [With Biosafety Cabinet]: Verify that the view screen of Biosafety is open at a proper position. If the problem persists, contact us.
[Error code 080099] Side stream illumination error.	The side stream illumination is unplugged.	 Plug in the side stream illumination properly. Refer to Figure 1.23. If the problem persists, contact us.
[Error code 080101] The sheath tank is over filled.	The sheath tank is over filled. The sheath tank scale does not work properly.	 Verify that the sheath level is lower than the position ring inside the sheath tank. Refer to Step 6 of Filling the Sheath Tank. Recalibrate the sheath tank scale. Refer to Resetting the Sheath Tank Scale in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.
[Error code 080102] Camera is disconnected.	 The cable between the camera and the USB is disconnected. The camera USB cable is not securely connected to the workstation. The stream camera is defective. 	 Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. If the problem persists, contact us.
[Error code 080103] Instrument disconnected.	The CytExpert software is frozen.	 Ensure that the network cable is securely connected to the lower left side of the Sorter and the back of the Workstation. Refer to Figure 1.36. If the problem persists, contact us.
[Error code 080117] Camera connection timeout.	The camera USB cable is not securely connected.	 Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. If necessary, re-connect the camera USB cable. Shutdown the system. Wait 20 seconds. Restart the system. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 080118] No stream is detected.	The nozzle is completely clogged. The O-ring is damaged. The nozzle module is not installed properly. The sheath line is broken. Others.	 Select Standby to turn off the sheath. Verify that the quick connectors on the sheath tank, the fluidics cart, and the Sorter are securely connected. Refer to Figure 1.6, Figure 1.8, Figure 1.11. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/ Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/ Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11,
		 Replacement/Adjustment Procedures. 6. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. 7. Run Flow cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. 8. Restart the system. 9. If the problem persists, contact us.
[Error code 090003] Failed to move the sample chamber.	 The sample station door is opened during the sample chamber movement. The sample chamber movement lacks lubricant. The sample chamber movement is blocked by an obstacle. The sample chamber interlock is defective. The sample chamber movement motor is defective. 	 Verify that the sample station is clear of any foreign obstacle. Close the sample station door. Try this step again. If the problem persists, select Urgent Stop to terminate the aseptic cleaning program first, and then contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090005] Low system pressure.	 The waste quick connectors are not securely connected. The air pump P1 is degraded. SMC air filters are clogged. SMC pressure relief valve is defective. The air line of sheath tank is clogged. The pressure sensor is defective. The valve VL-15 is defective. The fluidics control board is broken. 	 Tighten the sheath tank lid securely. Verify that the sheath tubing and the air tubing are securely connected to the correct quick connectors. Refer to Figure 1.8. Verify that the inner valve core of the pressure relief valve is present and ensure the pressure release valve is tightened securely. Refer to Figure 1.8. Verify that the waste quick connectors are securely connected on the fluidics cart and on the instrument. Refer to Figure 1.6 and Figure 1.11. Restart the system. If the problem persists, contact us.
[Error code 090006] High system pressure.	 The pressure reducing valve was adjusted improperly. The pressure reducing valve is defective. The pressure sensor PS is defective. The fluidics control board is broken. 	 Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 09007] Insufficient vacuum.	 The waste quick connectors are not securely connected. The vacuum head of air pump P1 is defective. Vacuum Chamber or its vacuum line leaks. The electromagnetic valve VL6, VL7, VL8, VL9, VL10, and/or the VL12 is defective. The pressure sensor VS is defective. The fluidics control board is broken. 	 Verify that the waste quick connectors are securely connected on the fluidics cart and on the instrument. Refer to Figure 1.6 and Figure 1.11. Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 090009] <i>Unstable</i> sheath tank pressure.	 The sheath regulator is not securely connected to the fluidics control board. The sheath regulator is defective. The fluidics control board is defective. Pressure fluctuation caused by unexpected actions. 	 Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 090010] Low sheath pressure.	 The sheath tank is lower than the Sorter by over 1 m. The sheath line is clogged. The sheath regulator is defective. The SOL sensor is insecurely connected to the fluidics board. The SOL sensor is defective. The fluidics control board is broken. 	 Verify that the quick connectors on the sheath tank, the fluidics cart, and the Sorter are securely connected. Refer to Figure 1.6, Figure 1.8, and Figure 1.11. Place the sheath tank at a higher position. Check for and remove any kinks in the sheath line. Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090011] High sheath pressure.	 The sheath tank is above the Sorter by over 1 m. The SOL sensor is insecurely connected to the fluidics board. The SOL sensor is defective. The sheath regulator is defective. The fluidics control board is broken. 	 Place the sheath tank at a lower position. Restart the system. If the problem persists, contact us.
[Error code 090014] Sheath tank air pressure is out of range.	 Air leaks in the air line of sheath tank. The sheath regulator is insecurely connected to the fluidics board. The sheath regulator is defective. The fluidics control board is broken. 	 Verify that the air tubing is securely connected to the sheath tank. Refer to Figure 1.8. Restart the system. If the problem persists, contact us.
[Error code 090015] Sheath tank air pressure is out of range.	 Air leaks in the air line of sheath tank. Air leaks in the sheath tank. The sheath regulator is insecurely connected to the fluidics board. The sheath regulator is defective. The fluidics control board is defective. 	 Select Standby to turn off the sheath. Verify that the air tubing is securely connected to the sheath tank. Refer to Figure 1.8. Select Initialize to turn on the sheath. If the problem persists, contact us.
[Error code 090017] Sample pressure is out of range.	 Air leaks in the sample line or the sample chamber. The quick connectors between the fluidics module and the sampler module are connected insecurely. The sample air filter is clogged. The sample regulator is defective. The valve VL4, VL7, or VL8 is defective. The sample regulator is insecurely connected to the fluidics board. The fluidics control board is broken. The sample regulator is defective. 	 Unload the sample. Wait for a few minutes. Reload the sample. If the problem persists, contact us.
[Error code 090018] Unstable sample pressure.	 Unexpected action causes the pressure fluctuation in the sample chamber. The sample regulator is insecurely connected to the fluidics board. The sample regulator is defective. 	 Unload the sample. Wait for a few minutes. Reload the sample. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090021] Failed to build up sheath tank pressure.	 The sheath tank lid is open or not tight enough. The air tubing is not securely connected to the sheath tank. The manual pressure relief valve is loose. The waste quick connectors are not securely connected. Air leaks in the air line of sheath tank. The air line of sheath tank is clogged. The air pump P1 is defective. Valve VL-15 is defective. SMC pressure relief valve is defective. The sheath regulator is not securely connected to the fluidics control board. The sheath regulator is defective. The sheath regulator is defective. The sheath regulator is defective. 	 Tighten the sheath tank lid securely. Verify that the sheath tubing and the air tubing are securely connected to the sheath tank. Refer to Figure 1.8. Verify that the inner valve core of the pressure relief valve is present and ensure the pressure release valve is tightened securely. Refer to Figure 1.8. Verify that the waste quick connectors are securely connected on the fluidics cart and on the instrument. Refer to Figure 1.6 and Figure 1.11. Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 090023] Failed to build up sample pressure.	 Air leaks in the sample chamber or sample air line. The sample air filter is clogged. The valve VL7, or VL8 is defective. The sample regulator is not securely connected to the fluidics control board. The sample regulator is defective. The fluidics control board is broken. 	 Unload the sample. Wait for a few minutes. Reload the sample. If the problem persists, contact us.
[Error code 090024] Sheath temperature is out of range.	 The sheath temperature is out of the required range 15-27 °C. The ambient temperature is out of the required range 15-27 °C. The sheath temperature sensor is defective. The sheath temperature sensor is not securely connected to the fluidics control board. The fluidics control board is broken. 	 Verify that the ambient temperature in the lab is within range (15-27 °C). Use appropriate air condition if necessary. Ensure the sheath temperature is within range (15-27 °C). Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090025] Empty sample tube.	 The sample runs empty. A tube is missing at the sample tube holder. The sample is colored, or turbid. The sample line is broken. The fluidics control board is broken. The sample line bubble detector is defective. 	 Verify that the sample in the sample tube is sufficient. Ensure that the tube is seated correctly on the sample station. Enable Bypass Bubble Detector. Refer to Software Settings in CHAPTER 2, Using the CytExpert SRT Software. NOTE Only use this function for the colored or turbid sample. If the Bypass function is enabled, the system will not alert you when the sample runs empty.
		 Verify that the sample probe height is accurate. Refer to Steps 10 - 14 in CHAPTER 11, Replacement/ Adjustment Procedures. Calibrate the bubble detector. Refer to Calibrating the Sample Line Bubble Detector in CHAPTER 11,
		 Replacement/Adjustment Procedures. Replace the sample line. Refer to Replacing the Sample Line in CHAPTER 11, Replacement/ Adjustment Procedures. Re-calibrate the bubble detector. Refer to Calibrating the Sample Line Bubble Detector in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.
[Error code 090026] Low sheath temperature.	 The sheath temperature is too low. The ambient temperature is too low. The sheath temperature sensor is not securely connected to the fluidics control board. The sheath temperature sensor is defective. The fluidics control board is broken. 	 Verify that the ambient temperature in the lab is within range (15-27 °C). Use appropriate air condition if necessary. Ensure that the sheath temperature is within the range (15-27 °C). Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 090027] High sheath temperature.	 The sheath temperature is too high. The ambient temperature is too high. The sheath temperature sensor is not securely connected to the fluidics control board. The sheath temperature sensor is defective. The fluidics control board is broken. 	 Verify that the ambient temperature in the lab is within range (15-27 °C). Use appropriate air condition if necessary. Ensure that the sheath temperature fluctuation is less than ± 2 °C. Ensure that the ventilation of the Sorter is clear of objects. Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090028] Failed to build up sheath tank pressure.	 The sheath tank lid is open or not tight enough. The manual pressure relief valve is loose. The air tubing is not securely connected to the sheath tank. The waste quick connectors are not securely connected. Air leaks in the air line of sheath tank. The air line of sheath tank is clogged. The air pump P1 is defective. Valve VL-15 is defective. SMC air filter is defective. SMC pressure relief valve is defective. The sheath regulator is not securely connected to the fluidics control board. The sheath regulator is defective. The fluidics control board is broken. 	 Tighten the sheath tank lid securely. Verify that the sheath tubing and the air tubing are securely connected to the sheath tank. Refer to Figure 1.8. Verify that the inner valve core of the pressure relief valve is present and ensure the pressure release valve is tightened securely. Refer to Figure 1.8. Verify that the waste quick connectors are securely connected on the fluidics cart and on the instrument. Refer to Figure 1.6 and Figure 1.11. Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 090029] Sheath pressure adjustment failed.	 Unexpected action causes the SOL pressure fluctuation. The sheath regulator is insecurely connected to the fluidics board. The sheath regulator is defective. The SOL sensor is not securely connected to the fluidics control board. The sheath on-line sensor SOL is defective. The fluidics control board is broken. 	 Restart the system. If the problem persists, contact us.
[Error code 090030] Low sheath temperature.	 The sheath temperature is out of the required range. The ambient temperature is out of the required range 15-27 °C. The sheath regulator is insecurely connected to the fluidics board. The sheath temperature sensor is defective. The fluidics control board is broken. 	 Ensure that the ambient temperature in the lab is within the range (15-27 °C) and the temperature fluctuation is less than ±2 °C. Use appropriate air condition if necessary. Ensure that the sheath temperature fluctuation is less than ± 2 °C. Ensure that the ventilation of the Sorter is clear of objects. Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090031] High sheath temperature.	 The sheath temperature is out of the required range. The ambient temperature is out of the required range 15-27 °C. The sheath regulator is insecurely connected to the fluidics board. The sheath temperature sensor is defective. The fluidics control board is broken. 	 Ensure that the ambient temperature in the lab is within the range (15-27 °C) and the temperature fluctuation is less than ±2 °C. Use appropriate air condition if necessary. Ensure that the sheath temperature fluctuation is less than ± 2 °C. Ensure that the ventilation of the Sorter is clear of objects. Restart the system. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 090033] Unstable sheath pressure.	 Unexpected action causes the sheath tank pressure fluctuation. The sheath regulator is insecurely connected to the fluidics board. The sheath regulator is defective. The SOL sensor is not securely connected to the fluidics control board. The sheath on-line sensor SOL is defective. The fluidics control board is broken. The sheath temperature fluctuation is out of range. The ambient temperature fluctuation is out of range. 	 Ensure that the ambient temperature in the lab is within the range (15-27 °C) and the temperature fluctuation is less than ±2 °C. Use appropriate air condition if necessary. Ensure that the sheath temperature fluctuation is less than ± 2 °C. Verify that the air tubing is securely connected to the sheath tank. Refer to Figure 1.8. Wait for at least 3 minutes. Do not take any action until the system gets recovered. Shutdown the instrument. Rerun the System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 090034] Abnormal sample pressure.	 The sample air line is not securely connected or leaks. The quick connectors between the fluidics module and the sampler module are connected insecurely. The sample air filter is clogged. The valve VL4, VL7, or VL8 is defective. The sample regulator is insecurely connected to the fluidics board. The sample regulator is defective. SPS pressure sensor is defective. The fluidics control board is broken. 	 Unload the sample. Wait for a few minutes. Reload the sample. If the problem persists, contact us.
[Error code 090035] Violet laser temperature is abnormal.	 The ambient temperature is beyond the range. The laser temperature sensor is defective. 	 Verify that the ambient temperature in the lab is within the range (15-27 °C). Use appropriate air condition if necessary. Restart the system. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090036] Blue laser temperature is abnormal.	The ambient temperature is beyond the range. The laser temperature sensor is defective.	 Verify that the ambient temperature in the lab is within the range (15-27 °C). Use appropriate air condition if necessary. Restart the system. If the problem persists, contact us.
[Error code 090037] Yellow laser temperature is abnormal.	The ambient temperature is beyond the range. The laser temperature sensor is defective.	 Verify that the ambient temperature in the lab is within the range (15-27 °C). Use appropriate air condition if necessary. Restart the system. If the problem persists, contact us.
[Error code 090038] Yellow laser temperature is abnormal.	 The ambient temperature is beyond the range. The laser temperature sensor is defective. 	 Verify that the ambient temperature in the lab is within the range (15-27 °C). Use appropriate air condition if necessary. Restart the system. If the problem persists, contact us.
[Error code 090039] DD laser temperature is abnormal.	 The ambient temperature is beyond the range. The laser temperature sensor is defective. 	 Verify that the ambient temperature in the lab is within the range (15-27 °C). Use appropriate air condition if necessary. Restart the system. If the problem persists, contact us.
[Error code 090040] Red laser temperature is abnormal.	 The ambient temperature is beyond the range. The laser temperature sensor is defective. 	 Verify that the ambient temperature in the lab is within the range (15-27 °C). Use appropriate air condition if necessary. Restart the system. If the problem persists, contact us.
[Error code 090044] Vacuum chamber is full.	 The waste quick connectors are not securely connected. The vacuum head of air pump P1 is degraded. The waste line of vacuum chamber is clogged. The float FL3 is insecurely connected to the fluidics control board. The float FL3 is defective. The fluidics control board is broken. 	 Verify that the waste quick connectors are securely connected on the fluidics cart and on the instrument. Refer to Figure 1.6 and Figure 1.11. Perform sheath filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Perform flow cell debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Restart the system. If the problem persists, contact us.
[Error code 090047] Low system pressure.	 The air pump P1 is degraded. The SMC filter is clogged. SMC pressure relief valve is defective. Air leaks in the air line of sheath tank. The air line of sheath tank is clogged. The valve V-15 is defective. The pressure sensor is defective. The fluidics control board is broken. 	 Unload the sample. Wait for a few minutes. Reload the sample. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090048] High system pressure.	 The pressure reducing valve was adjusted improperly. The pressure reducing valve is defective. The pressure sensor PS is defective. The fluidics control board is broken. 	 Unload the sample. Wait for a few minutes. Reload the sample. If the problem persists, contact us.
[Error code 090049] Insufficient vacuum.	 The waste quick connectors are not securely connected. The vacuum head of air pump P1 is degraded. vacuum chamber or the vacuum line leaks. The valve VL6, VL7, VL8, VL9, VL10, or VL12 is defective. The vacuum pressure sensor VS is defective. The fluidics control board is broken. 	 Verify that the waste quick connectors on the fluidics cart and the Sorter are securely connected. Refer to Figure 1.35. Unload the sample. Wait for a few minutes. Reload the sample. If the problem persists, contact us.
[Error code 090053] Power error.	 The 24V power supply is not stable. The power module is defective. The air pump is defective. The fan is defective. The sampler chamber motor is defective. The mixing motor is defective. The fluidics control board is broken. 	 Shutdown the system. Wait for a few minutes. Restart the system. If the problem persists, contact us.
[Error code 090054] Unstable sheath tank pressure.	 Unexpected action causes the sheath tank pressure fluctuation. The sheath regulator is defective. The sheath regulator is insecurely connected to the fluidics control board. 	 Verify that the air tubing is securely connected to the sheath tank. Refer to Figure 1.8. Select Standby to turn off the sheath. Wait for a few minutes. Select Initialize to turn on the sheath. If the problem persists, contact us.
[Error code 090055] Unstable sheath pressure.	 Unexpected action causes the sheath tank pressure fluctuation. The sheath regulator is defective. The sheath regulator is insecurely connected to the fluidics control board. 	 Verify that the air tubing is securely connected to the sheath tank. Refer to Figure 1.8. Select Standby to turn off the sheath. Wait for a few minutes. Select Initialize to turn on the sheath. If the problem persists, contact us.
[Error code 090096] The optical bench cover is not placed correctly.	The optical bench cover is opened.	 Verify that the optical bench cover is closed. Refer to Figure 1.13. If the problem persists, contact us.
[Error code 090097] The optical bench cover is not placed correctly.	The optical bench cover is opened.	 Verify that the optical bench cover is closed. Refer to Figure 1.13. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090114] Side stream monitor system error.	The side stream illumination is defective or not installed.	 Unplug in the side stream illumination. Refer to Figure 1.23. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Reinstall the side stream illumination properly. If the problem persists, contact us.
[Error code 090115] The self-diagnose of side stream illumination module failed. [Error code 090116] The self-diagnose of side stream illumination module failed. [Error code 090117] The self-diagnose of side stream illumination module failed. [Error code 090118] The self-diagnose of side stream illumination module failed. [Error code 090119] The self-diagnose of side stream illumination module failed. [Error code 090120] The self-diagnose of side stream illumination module failed. [Error code 090121] The self-diagnose of side stream illumination module failed.	The side stream illumination is defective or not installed.	 Unplug in the side stream illumination. Refer to Figure 1.23. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Reinstall the side stream illumination properly. If the problem persists, contact us.
[Error code 090122] Side stream illumination error.	 The side stream illumination is defective or not installed. The charging pins of the side stream illumination are not conductive. Optical bench control board is defective. Bad connection between optical control board and pins. PD board broken. Dust or foreign material on the PD window. DAQ board broken Bad connection between the DAQ and the side stream PD board. 	 Unplug in the side stream illumination. Refer to Figure 1.23. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Wipe the side stream detection window. Refer to Figure 1.23. Reinstall the side stream illumination properly. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090123] Urgent stop procedure is progressing.	Urgent Stop is selected by accident.	 Wait the system finishes the procedure. Shut down the system and switch off the Sorter. For the location of power switch, refer to Figure 1.36. Refer to System Shutdown in CHAPTER 8, Shutting Down the System. Wait for 20 seconds, and then restart the system. Refer to CHAPTER 3, Daily Startup If the problem persists, contact us.
[Error code 090124] Failed to move the sample chamber.	The sample station door is opened during the sample chamber movement. The sample chamber movement lacks lubricant. The sample chamber movement is blocked by an obstacle. The sample chamber interlock is defective. The sample chamber movement motor is defective.	 Verify that the sample station is clear of any foreign obstacle. Close the sample station door. Select Cytometer > Reset Sample Chamber. Run Backflush if needed. Select Cytometer > Backflush. Try this process again. If the problem persists, contact us.
[Error code 090125] Sheath tank air pressure is out of range.	 The sheath tank lid is open or not securely tightened. The air tubing is not securely connected to the sheath tank. The manual pressure relief valve is loose. The waste quick connectors are not securely connected. Air leaks in the air line of sheath tank. air line of sheath tank is clogged. The air pump P1 is degraded or defective. SMC filters are defective. SMC pressure relief valve is defective. The sheath regulator is insecurely connected to the fluidics control board. The sheath regulator is defective. The sheath regulator is defective. 	 Tighten the sheath tank lid securely. Verify that the sheath tubing and the air tubing are securely connected to the correct quick connectors. Refer to Figure 1.8. Verify that the inner valve core of the pressure relief valve is present and ensure the pressure release valve is tightened securely. Refer to Figure 1.8. Verify that the waste quick connectors are securely connected on the fluidics cart and on the instrument. Refer to Figure 1.6 and Figure 1.11. Restart the system. If the problem persists, contact us.

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 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 090130] Side stream illumination error.	 The side stream illumination is defective or not installed. The charging pins of the side stream illumination are not conductive. Optical bench control board is defective. Bad connection between optical control board and pins. PD board broken. Dust or foreign material on the PD window. DAQ board broken Bad connection between the DAQ and the side stream PD board. 	 Unplug in the side stream illumination. Refer to Figure 1.23. Clean the side stream illumination and the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures. Wipe the side stream detection window. Refer to Figure 1.23. Reinstall the side stream illumination properly. If the problem persists, contact us.
[Error code 090131] Failed to move the waste catcher.	A foreign object is in the sort chamber. Others.	 Verify that the sort chamber is clear of any foreign objects. If the problem persists, contact us.
[Error code 090132] The vacuum chamber is full.	 The waste quick connectors on the fluidics cart, or on the instrument are insecurely connected. The vacuum head of the air pump P1 is defective. The waste line of the vacuum chamber or the fluidics cart is clogged. The float FL3 is insecurely connected to the fluidics control board. The float FL3 is defective. The fluidics control board is broken. 	 Verify that the waste quick connectors are securely connected on the fluidics cart and the instrument. Refer to Figure 1.6 and Figure 1.11. Restart the system. Run System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 090133] Failed to adjust the sheath pressure.	 Unexpected action causes the SOL pressure fluctuation. The sheath regulator is insecurely connected to the fluidics control board. The sheath regulator is defective. The SOL sensor is defective. The SOL sensor is insecurely connected to the fluidics control board. The fluidics control board is broken. The sheath temperature fluctuation is out of range. The ambient temperature fluctuation is out of range. 	 Ensure that the ambient temperature in the lab is stable and within the range (15-27 °C). Use appropriate air condition if necessary. Ensure that the sheath temperature is stable and the temperature fluctuation is within the range of ±2 °C. Rerun QC. Rerun Sort Calibration. If the problem persists, contact us.

 Table 9.1 Troubleshooting-[Error Codes] (Continued)

Problem	Probable Cause	Corrective Action
[Error code 10004] Connection error.	 The Ethernet cable between the Sorter and the workstation is disconnected. The Sorter's power cable is disconnected. 	 Ensure that the network cable is securely connected to the lower left side of the Sorter and the back of the Workstation. Refer to Figure 1.36. Verify that the power cable is securely connected to the lower left side of the Sorter. Long-press the Urgent Stop button to shut down the instrument. Refer to Figure 1.12. Turn off the Sorter using the power switch on the left corner of the instrument. Wait 20 seconds. Restart the system. Refer to CHAPTER 3, Daily Startup. Run System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. If the problem persists, contact us.
[Error code 190001] Camera connection error.	 The cable between the camera and the USB is disconnected. The camera USB cable is not securely connected to the workstation. The stream camera is defective. 	 Ensure that the network cable is securely connected to the lower left side of the Sorter and the back of the Workstation. Refer to Figure 1.36. Verify that the camera USB on the Sorter is securely connected to the workstation. Refer to Figure 1.34. Restart the system. Refer to CHAPTER 3, Daily Startup. If the problem persists, contact us.

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Table 9.2 Troubleshooting [Others]

Problem	Probable Cause	Corrective Action
QC aborted due to low event rate.	The diluted CytoFLEX Daily QC Fluorospheres concentration is too low. The sample probe, or the sample line is clogged.	 Add 1 drop of CytoFLEX Daily QC Fluorospheres to the QC solution. Reload the target value file. Refer to Importing Lot-Specific Target Values in CHAPTER 4, Instrument Quality Control and Standardization. Prepare a new sample of the CytoFLEX SRT Daily QC Fluorospheres. Run Backflush. Select Cytometer > Backflush. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Rerun QC. Refer to CHAPTER 4, Instrument Quality Control and Standardization. If problem persists, contact us.
QC failed.	 rCV fails specifications. The laser delay settings are too high. The laser power settings fail to meet the target specification. The median fluorescence fails to meet the target specification. The QC gain value does not meet the target gain specifications. Air bubbles are in the sample, sheath line, or between the nozzle and nozzle lift. The Lot No. does not match the corresponding QC beads. Fluidics optimization failed. The diluted CytoFLEX Daily QC Fluorospheres concentration is too low. Optical alignment is required. The system failed to find out the correct DD1 value. 	 Rerun QC. Refer to CHAPTER 4, Instrument Quality Control and Standardization. Run Backflush. Select Cytometer > Backflush. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow Cell Clean. Refer to Flow Cell Clean Program in CHAPTER 10, Cleaning Procedures. Verify that the Lot No. is correct. Verify that the nozzle is clean and O-ring is present. Clean the nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Cleaning the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Wipe the bottom of cuvette with a clean swab. Refer to Daily Decontamination During Shutdown in CHAPTER 11, Replacement/Adjustment Procedures Rerun QC. If the problem persists, contact us.

Table 9.2 Troubleshooting [Others]

Problem	Probable Cause	Corrective Action
The background noise signal is too high.	 The threshold setting is too low. The sample concentration is too high. There are too many sample fragments. The sheath fluid filter is clogged. The sample flow rate requires calibration. 	 Use the manual threshold setting to increase the threshold. Refer to Adjusting the Threshold in CHAPTER 5, Sorting. Dilute the sample and adjust the concentration to approximately 10⁶/mL. Filter the sample using an appropriately sized mesh aperture filter. Restain the sample. Replace the Sheath Fluid Filter. Refer to Replacing the Sheath Fluid Filter in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.
No data acquisition.	 The threshold setting is too high. The gain setting is too low. Laser power is insufficient. The laser is turned off. The sample probe, the nozzle, or the sample line is clogged. Big bubbles are in the flow cell. WDM is defective. Communication error. 	 Decrease the threshold setting. Refer to Adjusting the Threshold in CHAPTER 5, Sorting. Increase the gain setting. Refer to Adjusting the Gain in CHAPTER 5, Sorting. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Restart the Sorter. Verify that the sample does not have excessive debris. If it does: Filter the sample using an appropriately sized mesh aperture filter. Restain the sample. Replace the sample tubing. Refer to Replacing the Sample Line in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.

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Table 9.2 Troubleshooting [Others]

Problem	Probable Cause	Corrective Action
Data populations are not where they are expected.	 The detector configuration setting is incorrect. The optical filter is not placed correctly. QC was not completed. Gain and threshold is not set correctly. Defective fiber or WDM. 	 Ensure that the detector configuration is set correctly. Refer to Verifying, Selecting, Editing, and Creating Detector Configuration in CHAPTER 5, Sorting. Ensure that the position of the optical filter in
		the WDM matches the detector configuration setting. Refer to Verifying, Selecting, Editing, and Creating Detector Configuration in CHAPTER 5, Sorting.
		3. Ensure that the optical filter is installed correctly. Refer to Replacing the Optical Filter in CHAPTER 11, Replacement/Adjustment Procedures.
		4. Follow the QC procedure. Refer to CHAPTER 4, Instrument Quality Control and Standardization.
		5. Review the gain and threshold settings. Refer to Adjusting the Gain and Adjusting the Threshold in CHAPTER 5, Sorting.
		6. Review the display ranges. Refer to Creating Plots and Gates in CHAPTER 5, Sorting.7. If the problem persists, contact us.
The calculation of the automatic compensation experiment is incorrect.	 Erroneous data acquisition. The gate is not set on the appropriate population. The events of the acquired cells are too low. The mean fluorescence of the positive cells is too weak. Use the wrong compensation beads. 	1. Ensure that the corresponding negative control tube and the individual positive tube acquired are from the same sample type.
		Ensure that the single colors collected correspond to the correct tube name. Ensure that the gate in the ESC/(SSC plate).
		3. Ensure that the gate in the FSC/SSC plot encloses the correct sample population.4. Ensure that the positive gate in each
		tube is correctly placed. 5. Modify the events to record to ensure
		that enough events are collected for the data population.
		6. Select samples with a stronger positive signal as the positive control.
		Or Use dedicated compensation beads such as VersaComp Antibody Capture Beads

Table 9.2 Troubleshooting [Others]

Problem	Probable Cause	Corrective Action
The stream is not vertical on the Droplet Status window.	 The nozzle is clogged or damaged. Air bubbles are in the system. The nozzle module is not installed properly. 	 Run Backflush. Select Cytometer > Backflush. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. Run Daily Clean. Refer to Daily Clean Program in CHAPTER 10, Cleaning Procedures. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Filter the sample using an appropriately sized mesh aperture filter. Replace the sample Line in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.
No visible side stream on the Side Stream Monitor window.	 The deflection plates are not installed. Wet, dirty, or salty high-voltage deflection plates. The sort protection door is open. The sheath tank is filled with the CytoFLEX SRT Shutdown fluid. 	 Clean the deflection plates and reinstall the deflection plates. Refer to Cleaning the Side Stream Illumination Source and the Deflection Plates in CHAPTER 10, Cleaning Procedures Close the sort protection door. Run Sort Calibration. Refer to Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting. Empty the sheath tank and refill the sheath tank with IsoFLOW Sheath or ISOTON II. Refer to Filling the Sheath Tank in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.

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Table 9.2 Troubleshooting [Others]

Problem	Probable Cause	Corrective Action
The waste catcher fails to catch the waste stream.	 The position of waste catcher does not match with the selected stream mode. The fluid stream is not vertical. The movement motor of waste catcher does not work. 	 Verify that the waste catcher is in the correct position. Refer to Changing the Stream Mode in CHAPTER 11, Replacement/Adjustment Procedures. Verify that the nozzle is clean and O-ring is present. Clean the nozzle if needed. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures. If necessary, replace the O-ring. Refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures. If the nozzle is damaged, replace the nozzle. Refer to Replacing the Nozzle in CHAPTER 11, Replacement/Adjustment Procedures. Reinstall the nozzle module. Refer to Removing/Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures. Run Flow Cell Debubble. Refer to Performing the Flow Cell De-bubble in CHAPTER 11, Replacement/Adjustment Procedures. If the problem persists, contact us.

Table 9.2 Troubleshooting [Others]

Problem	Probable Cause	Corrective Action
The waste catcher is overflowing.	The waste pump is clogged or broken. Others.	Select Standby to turn off the sheath. Wait for a few minutes.
		<u> </u>
		Risk of biohazardous contamination if you have skin contact with the waste container, its contents, and its associated tubing. The waste container and its associated tubing might contain residual biological material and must be handled with care. Clean up spills immediately. Dispose of the waste parts in accordance with your local regulations and acceptable laboratory procedures.
		De-clog the waste pump. a. Use a disposable dropper to dry the
		waste catcher.
		b. Unplug the waste catcher.
		c. Detach the waste tubing from the waste catcher.
		d. Use a clean syringe to inject DI water into the waste tubing quickly. Repeat this several times if needed.
		e. Connect the waste tubing to the waste catcher. and reinstall the waste catcher.
		3. Turn on the sheath. Verify that the waste pump is evacuating the waste from the waste catcher.
		4. If the problem persists, contact us.
Shutdown program aborts due to the error "The shutdown fluid container is empty, please refill the shutdown fluid container".	 The shutdown fluid container is empty. The float sensor of the shutdown fluid container is not installed properly. The float sensor of the shutdown fluid container is defective. 	Fill the shutdown fluid container. Refer to Filling the Shutdown Fluid Container in CHAPTER 11, Replacement/Adjustment Procedures.
		2. Ensure the cleaning harnesses are securely connected to the shutdown fluid container. Refer to Figure 1.35.
		3. Re-run System Shutdown program. Refer to CHAPTER 8, Shutting Down the System.
		4. If the problem persists, contact us.
The sheath tank cannot be opened.	The sheath pressure is not released completely.	Wait for a few minutes. Then reopen the sheath tank lid. Or manually release the pressure relief valve.
		Refer to Figure 1.8.
		2. If the problem persists, contact us.

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Table 9.2 Troubleshooting [Others]

Problem	Probable Cause	Corrective Action
The waste container gets swelled.	 The waste air filter requires to be replaced. The instrument has been used continuously for long time. 	 Run System Shutdown Program. Refer to CHAPTER 8, Shutting Down the System. Replace the waste air filter with a new one. Refer to Replacing the Waste Air Filter in CHAPTER 9, Troubleshooting. Restart the system. Refer to CHAPTER 3, Daily Startup.
The mixer is not functioning.	Sample mixing is disabled in the software.The mixer motor is defective.	 Set a desired sample mixing speed. If the problem persists, contact us.
The LED indicator located on the top of the sample station turns yellow and audible warning sounds.	 The sheath tank is empty or abnormal. The waste container is full. The shutdown fluid container is empty. The sort protection door is opened during the sorting. The sorting aborts. 	 Fill the sheath tank. Refer to Filling the Sheath Tank in CHAPTER 11, Replacement/ Adjustment Procedures. Empty the waste container. Refer to Emptying the Waste Container in CHAPTER 11, Replacement/Adjustment Procedures. Fill the shutdown fluid container. Refer to Filling the Shutdown Fluid Container in CHAPTER 11, Replacement/Adjustment Procedures. Restart the Software. If the problem persists, contact us.
The LED indicator located on the top of the sample station turns red, and audible warning sounds.	Error occurs.	 Troubleshoot the system according to the error information in this table. If the problem persists, contact us.
Plots are cut off when printing a PDF.	Plots need to be rearranged.	Rearrange the plots until the print preview screen shows all plots correctly.
The Workstation cannot be turned on.	 The power cable is not securely connected. The Workstation was restarted too fast. 	 Ensure that the power cable is securely connected to the workstation. Refer to Figure 1.34. Unplug the power cable. Wait 20 seconds, then plug the power cable back in. Then, restart the computer. If the problem persists, contact us.
The Sorter cannot be turned on.	 The power switch is in the off position. The power cable is not securely connected. The fuse is blown. The Sorter was turned on by pressing the Urgent Stop button. The Sorter was turned on by pressing the power switch shortly after selecting Turn Off from the Cytometer menu. 	 Ensure that the power cable is securely connected to the Sorter. Refer to Figure 1.34. Wait for 20 seconds, and switch on the Sorter. For the location of power switch, refer to Figure 1.36. Or select Turn On from the Cytometer menu to turn on the Sorter. If the problem persists, contact us.

Table 9.2 Troubleshooting [Others]

Problem	Probable Cause	Corrective Action
Instrument operations cannot be performed on the software.	The software is frozen. Communication error.	 Long-press the Urgent Stop button to shut down the instrument. Refer to Figure 1.12. Turn off the Sorter using the power switch on the left corner of the instrument. Wait 20 seconds. Restart the system. Refer to CHAPTER 3, Daily Startup.
		 4. Run System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup. 5. If the problem persists, contact us.
Others.	Multiple issues.	 Run System Shutdown Program. Refer to CHAPTER 8, Shutting Down the System. Turn off the Sorter using the power switch on the left corner of the instrument. Wait 20 seconds.
		3. Restart the system. Refer to CHAPTER 3, Daily Startup.
		4. Run System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup.
		5. If the problem persists, contact us.

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Cleaning Procedures

Overview

This chapter describes how to carry out certain routine and nonscheduled cleaning procedures. Proper cleaning can help extend the service life of the instrument and ensure optimal sorting. When conducting any cleaning, take all necessary biosafety precautions and use proper personal protective equipment.

In addition to performing preventive maintenance procedures, Beckman Coulter also recommends that you establish and perform other laboratory procedures for routine operations such as backing up your data and experimental protocols.

This chapter contains information on:

- Routine Cleaning
 - Daily Clean Program
 - Flow Cell Clean Program
 - Aseptic Clean Program
 - Cleaning the Side Stream Illumination Source and the Deflection Plates
 - Cleaning the Nozzle
 - Cleaning the Sheath Tank
 - Cleaning the Waste Container
 - Daily Decontamination During Shutdown
- Nonscheduled Cleaning
 - Biosafety Cabinet

Routine Cleaning

Three cleaning options are available from the Cytometer menu:

- Daily Clean Program
- Flow Cell Clean Program
- Aseptic Clean Program

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Daily Clean Program

Perform the Daily Clean on a daily basis before shutting down the instrument. Daily Clean can also be used to remove residual sample from previous tubes.

After sampling an excessively large sample or a sample that can easily clog the sample probe, it is recommended to perform the Daily Clean procedure.

IMPORTANT To adequately decontaminate the residual of the biohazardous sample, or the fluorescent dyes which could easily remain in the sample line, repeat one more cycle of Daily Clean using 10% high-quality, fragrance-free, gel-free bleach and DI water respectively.



Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

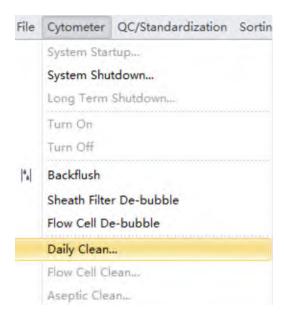
Required materials

- 12 x 75 mm tube
- Deionized water
- FlowClean solution
- 10% Bleach for decontamination (if needed)
- 1 Select **Initialize** to put the instrument in the Ready state.

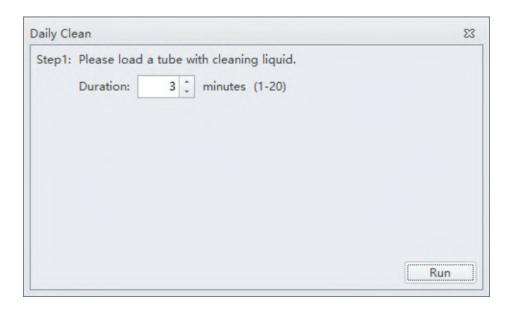
NOTE Skip this step if the instrument has already been initialized.

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2 Select **Daily Clean** in the Cytometer menu.



The Daily Clean window displays.

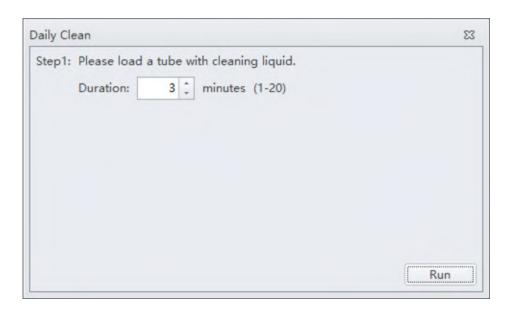


3 Add 2 mL of FlowClean solution to an unused sample tube.

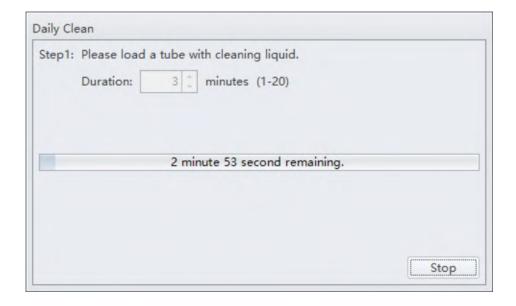
NOTE Use 10% high-quality, fragrance-free, gel-free bleach as the cleaning liquid, if needed.

4 Add 3 mL of DI water to another sample tube.

5 Insert the sample tube with 2 mL of FlowClean solution into the sample holder and select Run.
NOTE The default cleaning time is 3 minutes.

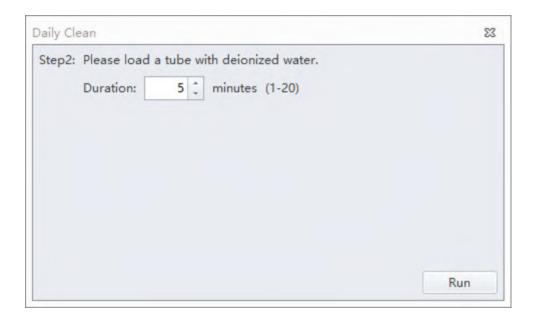


The system starts loading the Flow Clean solution.



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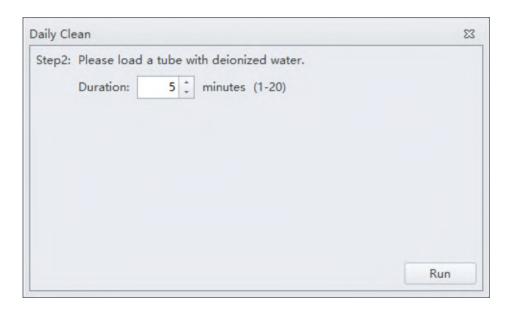
 $\mathbf{6}$ Remove the Flow Clean solution tube when the following window appears.

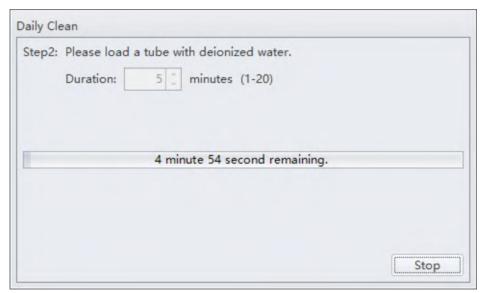


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7 Insert the DI water tube into the sample holder and select Run.

NOTE The default cleaning time is 5 minutes.





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8 Remove the DI water tube and select **Close** when the Daily Clean program is completed.



Flow Cell Clean Program

Carry out the Flow Cell Clean Program once a month. It is recommended to perform the Flow Cell Clean before shutting down or restarting the instrument If the instrument will not be used for more than 5 days.

IMPORTANT Once you begin, make sure you complete the entire Flow Cell Clean procedure. The entire process takes about 35 minutes.



Do not power off the system when the Flow Cell Clean program is in process. Unexpected termination may cause damage to the system. If the Flow Cell Cleaning program is terminated by accident, remove the nozzle module and clean the bottom of cuvette immediately (refer to step 9), restart the instrument, and rerun the Flow Cell program.

The follow-up screens are different depending on the setting of **Shutdown after cleaning**. Refer to Flow Cell Clean [with Shutdown after Cleaning Disabled] if the **Shutdown after Cleaning** is unselected. Refer Flow Cell Clean [with Shutdown after Cleaning Enabled] if the **Shutdown after Cleaning** is selected.

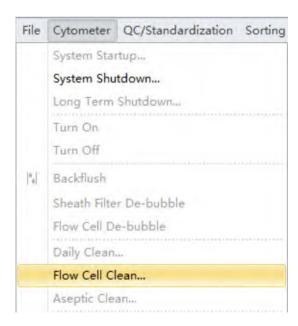
Required materials

- 12 x 75 mm tube
- 3 mL Contrad 70 solution (1:1 dilution)

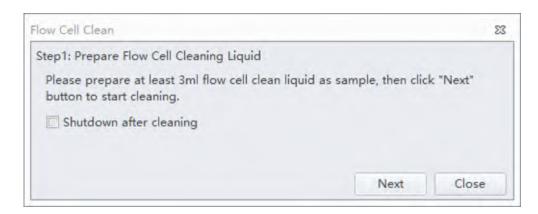
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Flow Cell Clean [with Shutdown after Cleaning Disabled]

- 1 Select Standby.
- 2 Select Flow Cell Clean in the Cytometer menu.



The Flow Cell Clean window appears.



NOTE Select **Shutdown after cleaning** to run the System Shutdown program automatically after completing the Flow Cell Clean program.

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↑ WARNING

Risk of chemical injury from Contrad® 70 reagent. To avoid contact with the Contrad® 70 reagent, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

3 Add 3 mL of diluted Contrad 70 reagent to an unused sample tube.

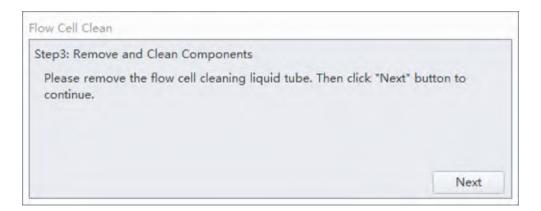
WARNING

Risk of chemical injury from Contrad® 70 reagent. To avoid contact with the Contrad® 70 reagent, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

- 4 Insert the sample tube with the Contrad 70 reagent into the sample holder.
- **5** Select **Next** to start the Flow Cell Clean process.



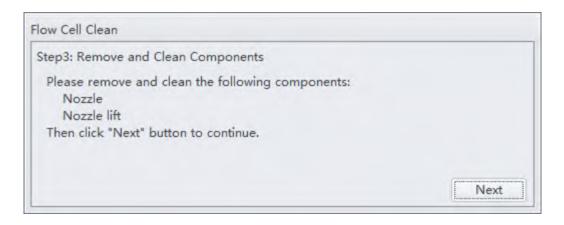
Wait for the Flow Cell Clean process to finish. The following window appears.



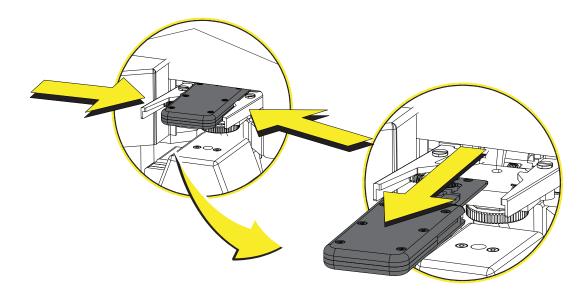


Risk of chemical injury from Contrad® 70 reagent. To avoid contact with the Contrad® 70 reagent, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

6 Remove the Contrad 70 reagent tube and select **Next**. The following window appears.

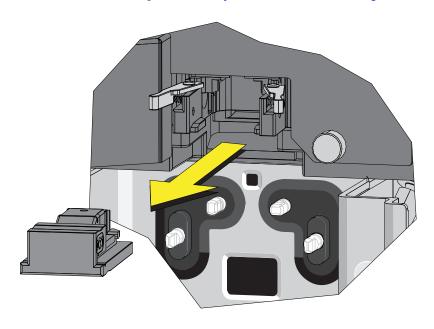


7 Remove the nozzle module and clean the nozzle. For instructions on cleaning the nozzle, refer to Cleaning the Nozzle.

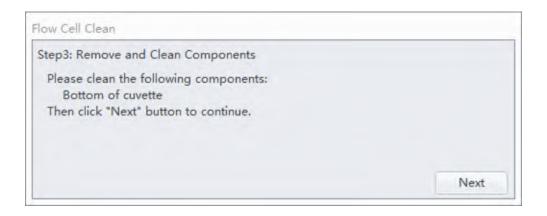


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Unplug the nozzle lift from the Sorter and clean the nozzle lift. For instructions on cleaning the nozzle lift, refer to Steps 4 -6 in Daily Decontamination During Shutdown.



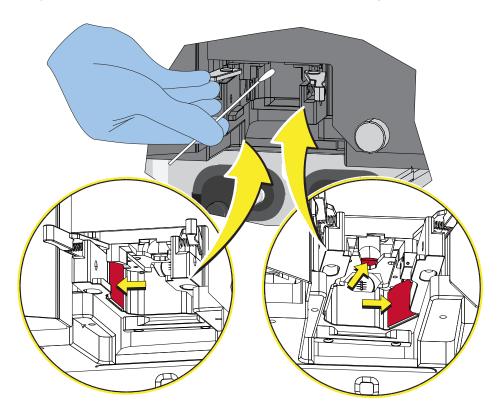
9 Select Next.



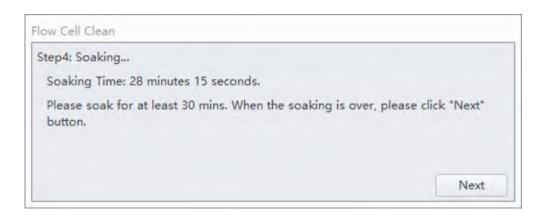
10 Apply a small amount of anhydrous alcohol to a clean swab.

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11 Gently wipe the bottom of the cuvette, and the optics protection glass with the moistened swab.



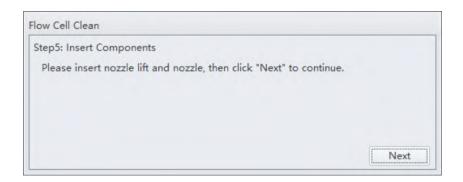
12 Select Next.



NOTE It is recommended to leave the cleaning solution in the flow cell for approximately 30 minutes. However, this is not mandatory.

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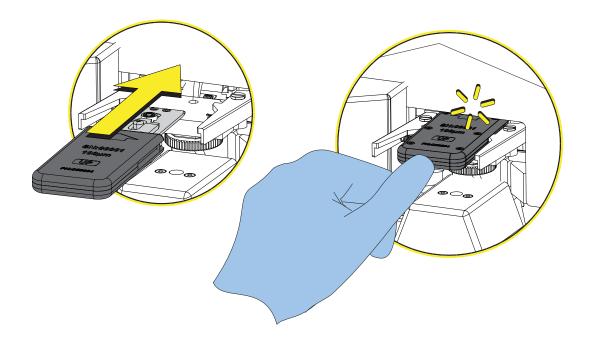
13 Select Next. The following Flow Cell Clean window appears.



! CAUTION

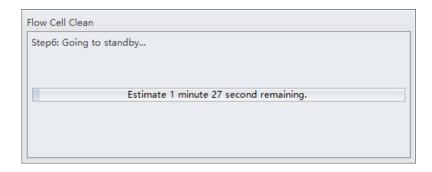
Risk of instrument damage. The sort module (flow cell) assembly can be damaged if the nozzle lift is not installed in the correct order. Ensure you install the nozzle lift BEFORE installing the nozzle to prevent damage to the sort module (flow cell) assembly.

- **14** Reinstall the nozzle lift.
- **15** Reinstall the nozzle module.

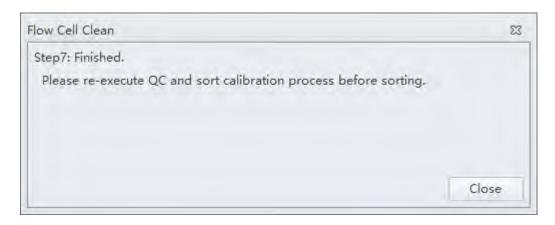


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16 Select Next.



17 Select Close when the Flow Cell Clean process finishes.



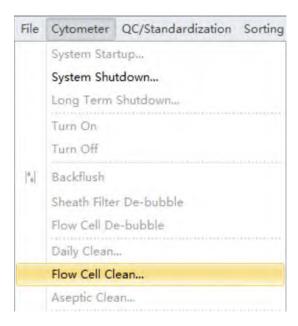
NOTE The Flow Cell Clean program might introduce bubbles into the system. Proceed removing the bubbles. Refer to Removing Trapped Air Bubbles in CHAPTER 11, Replacement/Adjustment Procedures.

Flow Cell Clean [with Shutdown after Cleaning Enabled]

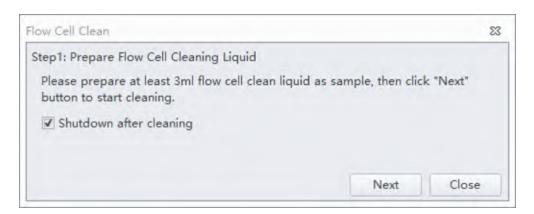
1 Select Standby.

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2 Select Flow Cell Clean in the Cytometer menu.



The Flow Cell Clean window appears.



! WARNING

Risk of chemical injury from Contrad® 70 reagent. To avoid contact with the Contrad® 70 reagent, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

3 Add 3 mL of diluted Contrad 70 reagent to an unused sample tube.

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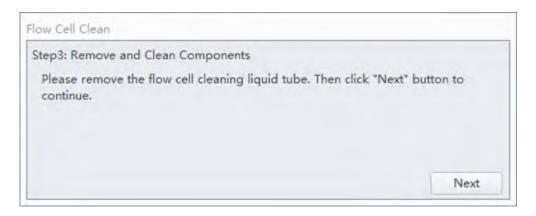


Risk of chemical injury from Contrad® 70 reagent. To avoid contact with the Contrad® 70 reagent, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

- 4 Insert the sample tube with the Contrad 70 reagent into the sample holder.
- 5 Select **Next** to start the Flow Cell Clean process.



Wait for the Flow Cell Clean process to finish. The following window appears.

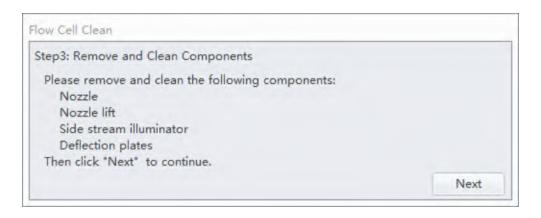


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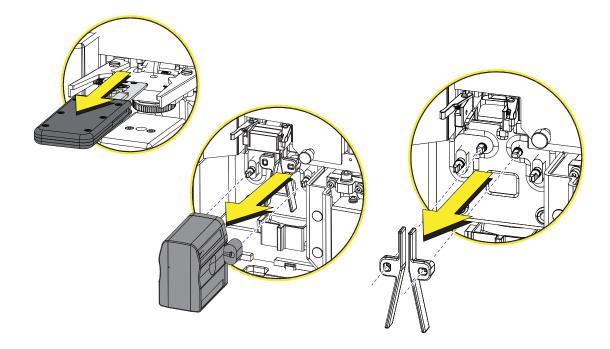
WARNING

Risk of chemical injury from Contrad® 70 reagent. To avoid contact with the Contrad® 70 reagent, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

6 Remove the Contrad 70 reagent tube and select **Next**. The following window appears.

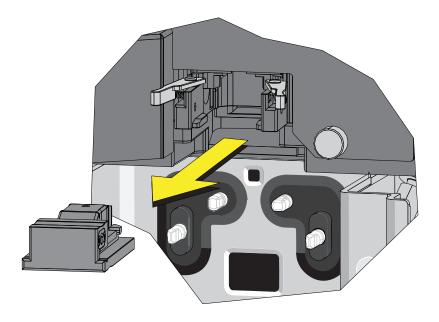


Remove the nozzle module, the side stream illumination source, and the deflection plates.

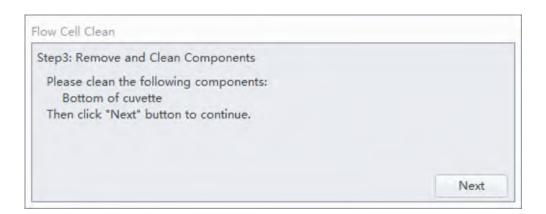


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8 Unplug the nozzle lift from the Sorter.



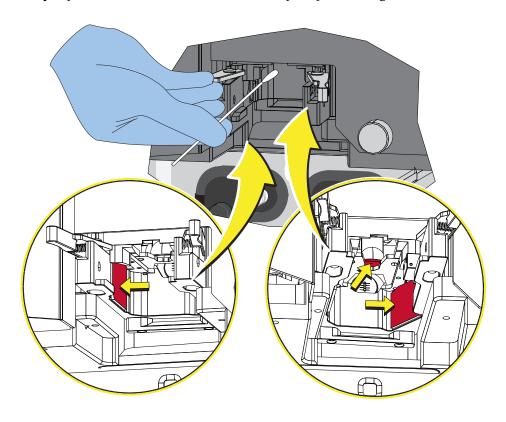
- 9 Clean the nozzle. For instructions on cleaning the nozzle, refer to Cleaning the Nozzle.
- **10** Clean the nozzle lift, side stream illumination source, and the deflection plates. For instructions, refer to Steps 4 -12 in Daily Decontamination During Shutdown.
- 11 Select Next.



12 Apply a small amount of anhydrous alcohol to a clean swab.

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13 Gently wipe the bottom of the cuvette, and the optics protection glass with the moistened swab.



14 Select Next.



NOTE The default setting is 30 minutes. You can set the soaking time according to your needs.

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Leave the cleaning solution in the flow cell for approximately 30 minutes.



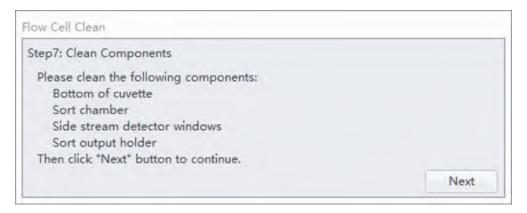
NOTE Use **Skip** to stop the soaking at any time before the soaking ends.

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15 The system starts to run the Shutdown Program automatically.

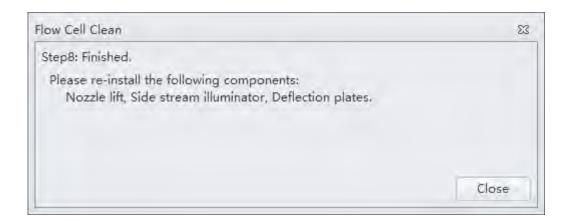






16 Clean the bottom of cuvette, sort chamber, side stream detection windows, and the sort output holder. For instructions, refer to Steps 9 -15 in Daily Decontamination During Shutdown.

17 Select Next.





Risk of instrument damage. The sort module (flow cell) assembly can be damaged if the nozzle lift is not installed in the correct order. Ensure you install the nozzle lift BEFORE installing the nozzle to prevent damage to the sort module (flow cell) assembly.

- **18** Reinstall the nozzle lift.
- **19** Reinstall the deflection plates and the side stream illumination source.
- **20** Select **Close**. The system goes to the idle state.

Aseptic Clean Program

Carry out an aseptic clean if the instrument is not used for more than 30 days or prior to performing an aseptic sorting. Perform the Aseptic Clean procedure before running the System Startup Program or after completing the System Shutdown Program.

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IMPORTANT Once you begin, make sure you complete the entire Aseptic Clean procedure before leaving the instrument. The process takes about 60 minutes.

IMPORTANT If the Aseptic Clean procedure is terminated by accident, you must repeat the Aseptic Clean procedure or run the System Startup program.

IMPORTANT Do not mix bleach and ethanol. Rinse with DI water in between using solutions.



Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.



Risk of instrument damage. Do not use potassium hydroxide or sodium hydroxide like Contrad 70 reagent to clean the sheath tank or sheath line.



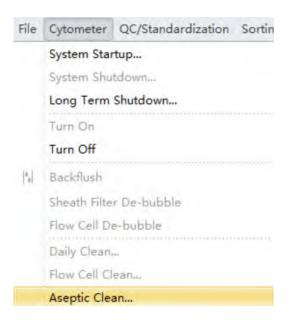
Risk of fire hazard. Ethanol is a volatile liquid that cannot be used near a fire source.

Required materials

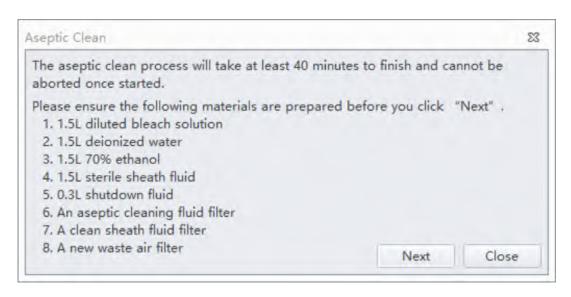
- 1.5 L 10% high-quality, fragrance-free, gel-free bleach solution
- 1.5 L deionized water
- 1.5 L 70% ethanol in deionized water
- 1.5 L sterile sheath
- 0.3 L CytoFLEX SRT Shutdown Fluid
- Sheath fluid filter
- Aseptic cleaning solution filter
- New waste air filter
- 1 Verify that the instrument is in the idle state.

NOTE If the instrument is in the Standby or Ready state, run the System Shutdown Program first. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.

2 Select **Aseptic Clean** in the Cytometer menu.



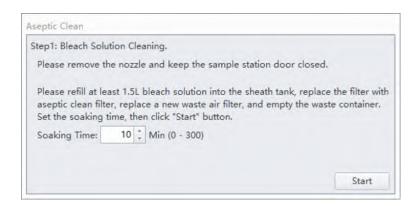
The following window appears.



Werify that the shutdown fluid in the shutdown fluid container is sufficient. If necessary, fill the shutdown fluid container with CytoFLEX SRT Shutdown fluid. Refer to Filling the Shutdown Fluid Container in CHAPTER 11, Replacement/Adjustment Procedures.

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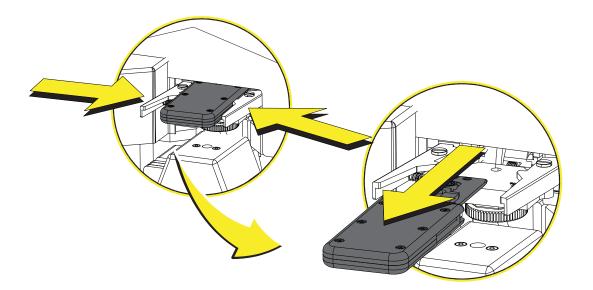
4 Select **Next**. The following window displays.



The status bar prompts that an Aseptic clean program is in process.



5 Remove the nozzle module by pushing the metal release clamps inwards.

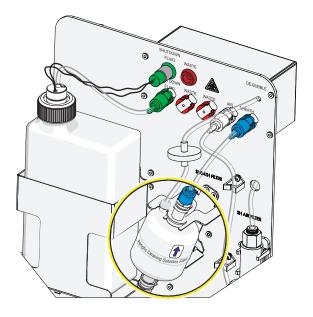


6 Close the sample station door.



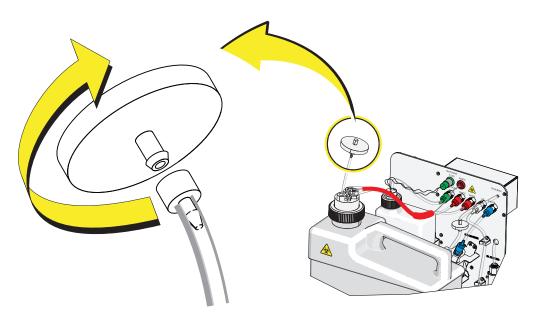
Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

- **7** Empty the sheath tank and refill the sheath tank with at least 1.5 L 10% high-quality, fragrance-free, gel-free bleach solution. Refer to Filling the Sheath Tank in CHAPTER 11, Replacement/Adjustment Procedures.
- **8** Replace the sheath fluid filter with an aseptic cleaning filter. For instructions, refer to Replacing the Aseptic Cleaning Solution Filter in CHAPTER 11, Replacement/Adjustment Procedures.



10-26 C37808AA

9 Replace the waste air filter with a new one. For instructions, refer to Replacing the Waste Air Filter in CHAPTER 11, Replacement/Adjustment Procedures.



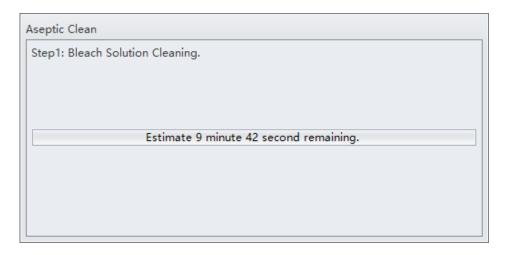
10 Empty the waste container. Refer to Emptying the Waste Container in CHAPTER 11, Replacement/Adjustment Procedures.

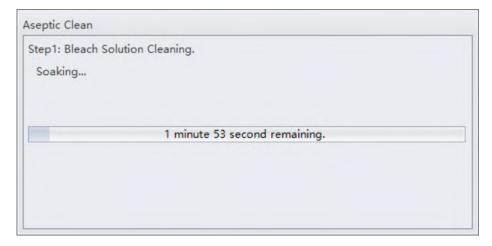
11 Set the Soaking Time.

NOTE The default soaking time is 10 minutes.

IMPORTANT Every time when you put the filled sheath tank back onto the sheath tank scale, wait for a moment. Do not select **Start** until the sheath status turns green. Otherwise, the Aseptic Cleaning process will be terminated.

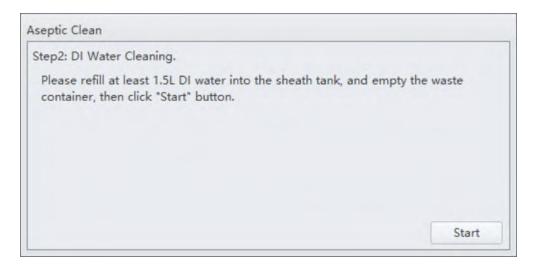
12 Select **Start**. The system starts to clean the sheath line with the 10% high-quality, fragrance-free, gel-free bleach solution.



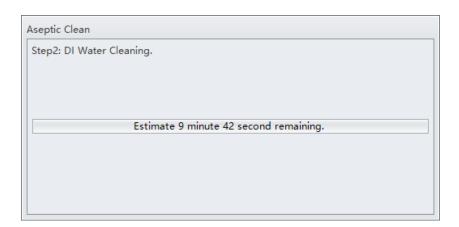


10-28 C37808AA

The following software message appears when the Bleach Solution soaking process finishes.

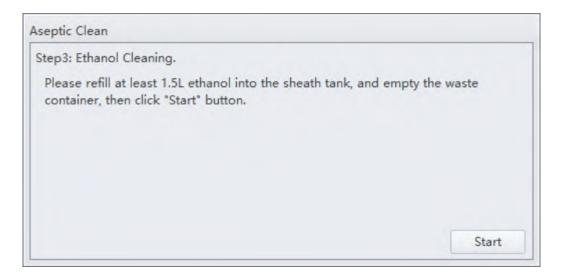


- **13** Empty the sheath tank and refill the sheath tank with at least 1.5 L deionized water. Refer to Filling the Sheath Tank in CHAPTER 11, Replacement/Adjustment Procedures.
- **14** Empty the waste container. Refer to Emptying the Waste Container in CHAPTER 11, Replacement/Adjustment Procedures.
- **IMPORTANT** Always wait for a moment each time you return the filled sheath tank back onto the sheath tank scale. Do not select **Start** until the sheath status turns green. Otherwise, the Aseptic Cleaning process will be terminated.
- **15** Wait for the sheath status to turn green, then select **Start**. The system starts to clean the sheath line with deionized water.



C37808AA

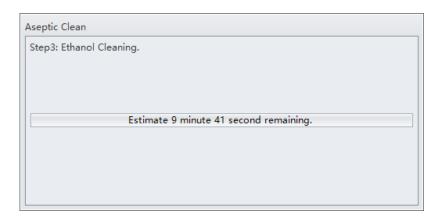
The following software message appears when the DI Water Cleaning process finishes.





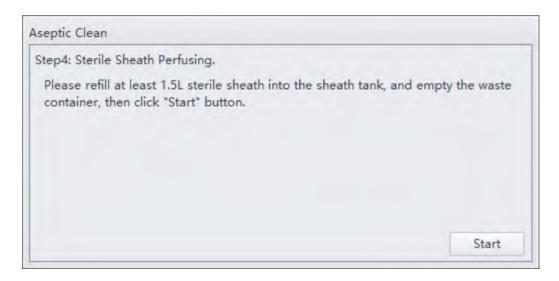
Risk of fire hazard. Ethanol is a volatile liquid that cannot be used near a fire source.

- **16** Empty the sheath tank and refill the sheath tank with at least 1.5 L ethanol. Refer to Filling the Sheath Tank in CHAPTER 11, Replacement/Adjustment Procedures.
- **17** Empty the waste container. Refer to Emptying the Waste Container in CHAPTER 11, Replacement/Adjustment Procedures.
- 18 Select Start. The system starts to clean the sheath line with the 70% ethanol solution.



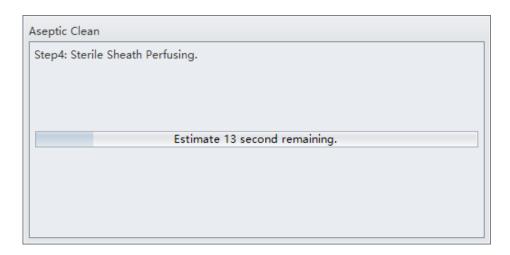
10-30 C37808AA

The following software message appears when the Ethanol Cleaning process finishes.



- **19** Empty the sheath tank and refill the sheath tank with at least 1.5 L sterile sheath. Refer to Filling the Sheath Tank in CHAPTER 11, Replacement/Adjustment Procedures.
- **20** Empty the waste container. Refer to Emptying the Waste Container in CHAPTER 11, Replacement/Adjustment Procedures.

21 Select **Start**. The system starts to perfuse the sheath tubing with sterile sheath.

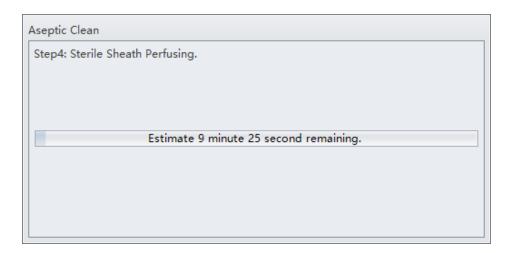




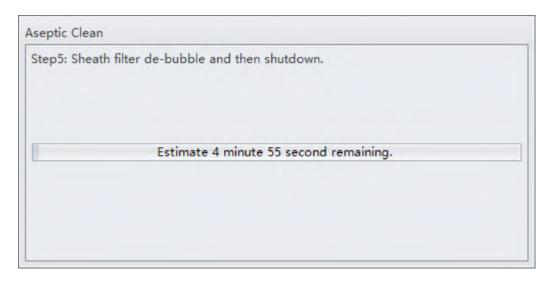
22 Remove the aseptic cleaning solution filter and reinstall the sheath fluid filter. Refer to Replacing the Sheath Fluid Filter in CHAPTER 11, Replacement/Adjustment Procedures.

10-32 C37808AA

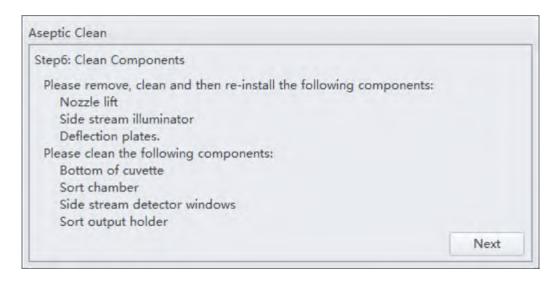
 ${\bf 23}\,$ Select ${\bf Start}$ to continue the sheath perfusion.



When the Sterile Sheath Perusing finishes, the system starts to debubble and run the Shutdown program automatically.



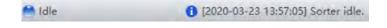
Then the following window appears.



- **24** Perform the cleaning. Refer to Daily Decontamination During Shutdown.
- **25** Select **Next**. The following window appears.



26 Select **Close**. The instrument enters the idle state.



27 Optional: Carry out System Startup Program if you want to proceed with the aseptic sorting.

10-34 C37808AA

Or turn off the instrument if you want to leave the instrument.

Cleaning the Side Stream Illumination Source and the Deflection Plates

The Stream Camera images are optimized by cleaning the deflection plates. Regular cleaning of deflection plates helps ensure optimal sorting. It is recommended to clean the deflection plates as part of the daily shutdown or when necessary.







Risk of biohazardous contamination if you have skin contact with the deflection plates. The deflection plates could contain residual biological material. Use barrier protection, including protective eye wear, gloves, and suitable laboratory attire.

1 Open the sort protection door.

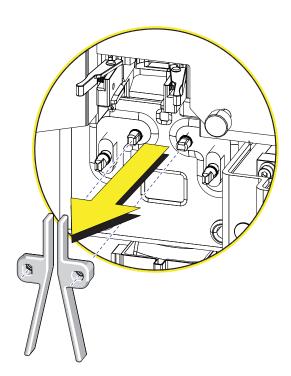
C37808AA

2 Pull off the side stream illumination source from the Sorter. See Figure 1.23.

WARNING

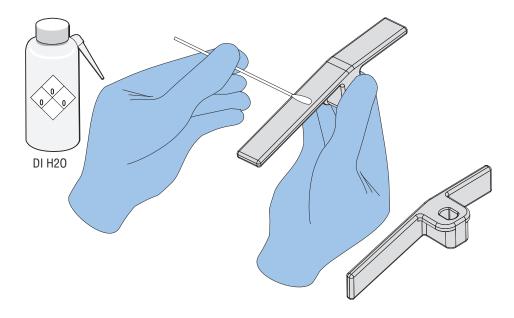
Risk of high voltage. Do not touch the deflection plates when the high voltage is on. To protect the user from electrical shock, the safety interlock (see Figure 1.21) is designed to disable the high voltage while opening the sort protection door. Do not attempt to defeat the safety interlock except when this document specifically instructs you to do so.

3 Pull off the deflection plates.



10-36 C37808AA

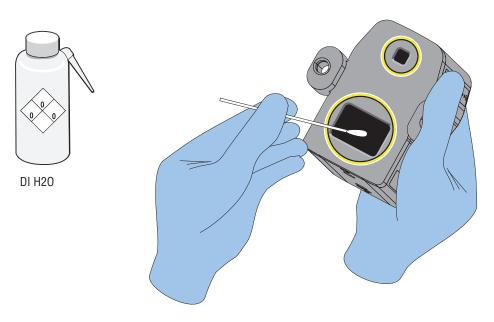
4 Gently wipe the deflection plates with the swab moistened with DI water.



WARNING

Risk of fire hazard. Absolute ethanol is a volatile liquid that cannot be used near a fire source.

5 Gently wipe the side stream illumination source with the moistened swab.



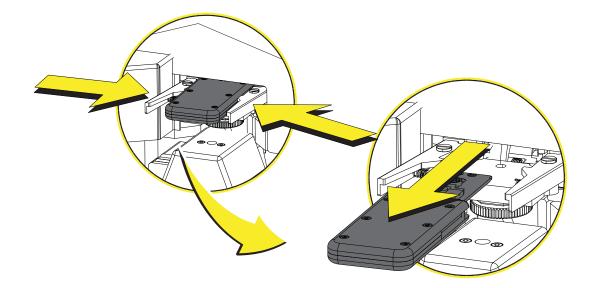
NOTE It is recommended to repeat this using the dustless paper moistened with anhydrous alcohol. Wipe the surface from one side to another.

- **6** Reinstall the deflection plates by firmly pushing them onto the pegs in the Sort Chamber.
- **7** Reinstall the side stream illumination source.
- **8** Close the sort protection door and the sort chamber door.

Cleaning the Nozzle

A clean nozzle helps ensure optimal sorting. Verify that the nozzle is free of debris every time when you use it. Follow the instructions below to clean the nozzle.

- 1 Select **Standby** to Turn Off Sheath.
- **2** Remove the nozzle module. Refer to Removing/Installing the Nozzle Module in CHAPTER 11, Replacement/Adjustment Procedures.



10-38 C37808AA

Fill a clean beaker with DI water and submerge the nozzle in the DI water. The DI water should be clean.



DI H₂O

4 Use an ultrasonic cleaning device to clean the nozzle for 30 seconds.

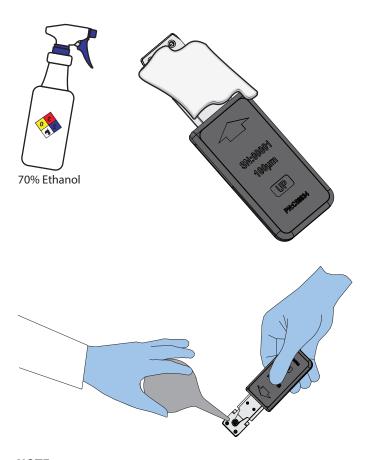
CAUTION

Risk of clogging the nozzle. Do not touch the nozzle by hand. The debris from your hand could clog the nozzle. A clogged nozzle could cause unstable fluid stream or obstruct the flow cell.

5 Take the nozzle module out of the DI water.

C37808AA

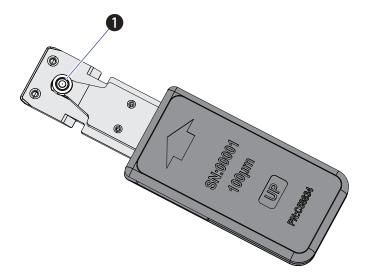
6 Wipe the nozzle with the lint-free tissue or flush the nozzle using a squeeze bulb to dry the residual water.



NOTE Dry the nozzle completely, especially for the reverse side. Otherwise, the fluid stream might be off center.

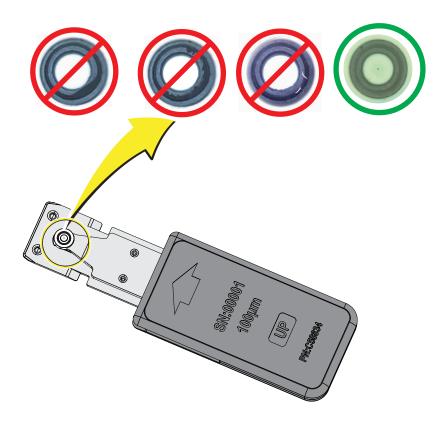
10-40 C37808AA

7 Verify that the black O-ring (1) is securely seated in the nozzle module.



C37808AA

f 8 Visually inspect the O-ring under magnification for debris or deformation.

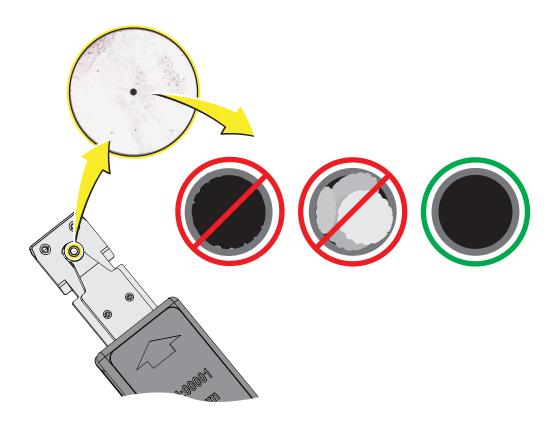


If there is any debris present, repeat Steps 3-6.

If the O-ring is degraded or deformed, replace the O-ring. For instructions, refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures.

10-42 C37808AA

9 Visually inspect the nozzle under magnification for salt crystals or cellular debris. Repeat Steps 3-6 if there is any debris present.



NOTE The inner of a nozzle should be a perfect circle and free of any debris.

10 Install the nozzle module or store it in a safe place.

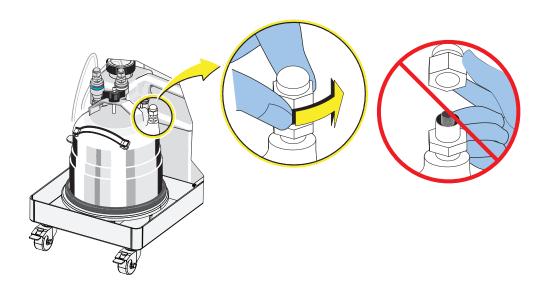
Cleaning the Sheath Tank

NOTE Cleaning the sheath tank can be done daily or weekly as deemed appropriate by your laboratory manager.

Shut down the system. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.

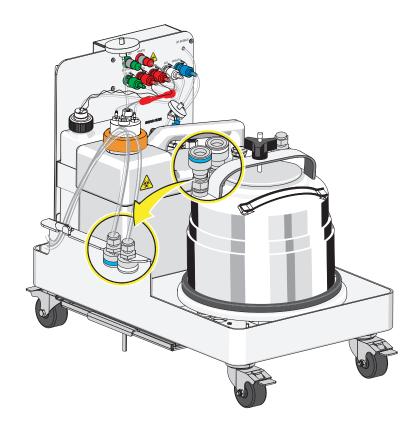
NOTE If the system is in the idle state, skip to Step 3.

2 Optional: Twist the pressure release valve anti-clockwise to release the pressure of sheath tank completely. You will hear the pressure escaping (a hissing sound).



NOTE The core of pressure release valve is easy to drop. Do not remove the pressure release valve from the sheath tank. Once the pressure is released completely, re-tighten the pressure release valve.

3 Disconnect the sheath outlet connector and the air inlet connector from the sheath tank.

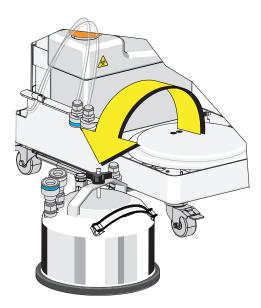


10-44 C37808AA

CAUTION

Risk of instrument damage. Remove the sheath tank from the Fluid Cart and fill away from the instrument to prevent spills that could damage the instrument circuitry.

4 Remove the sheath tank from the fluidics cart.

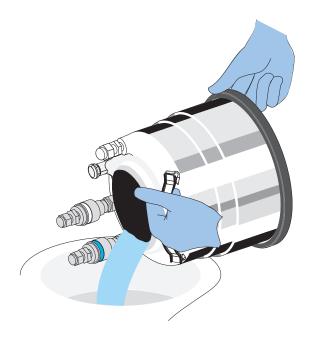


IMPORTANT Ensure the pressure in the sheath tank is completely released otherwise you cannot remove the lid.

5 Remove the lid from the sheath tank (rotate counterclockwise). To prevent soiling the sheath fluid, do not touch the inside of the lid and set the lid aside on a clean surface such as a paper towel.



6 Empty the residual sheath fluid from the sheath tank.



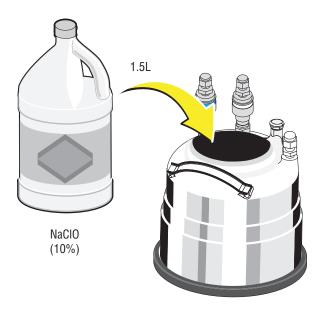
10-46 C37808AA

CAUTION

Risk of chemical hazard. Take care not to overfill the sheath tank. Clean up spills immediately. Use barrier protection including gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

 ${f 7}$ Add about 1.5 L 10% high-quality, fragrance-free, gel-free bleach solution to the sheath tank.

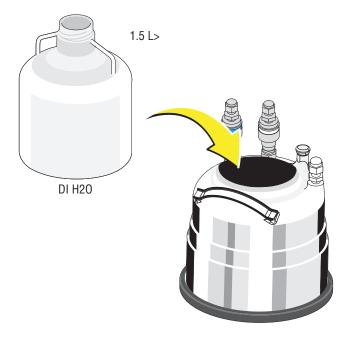
NOTE See APPENDIX A, Approved Cleaners and Disinfectants for more information.



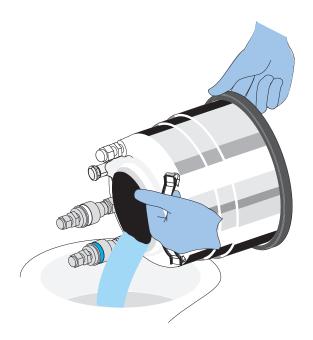
8 Place the lid back on the sheath tank and tighten it.



- **9** Swirl the fluid in the sheath tank, rinsing all surfaces.
- 10 Empty the sheath tank and refill the sheath tank with at least 1.5 L deionized water.



- 11 Swirl the fluid in the sheath tank, rinsing all surfaces.
- **12** Empty the sheath tank.



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13 Optional: Autoclave the sheath tank.

NOTE It is not necessary to remove the sheath fittings, the seal ring, and the pressure release valve since all of them are autoclavable.

NOTE Use the recommended settings for the autoclave:

Autoclave temperature: 121 °C;

Pressure: 15 PSI;Duration: 15 minutes.

CAUTION

Risk of clogging the sheath line. Contaminated sheath can shorten the service life of the sheath fluid filter. Take care not to contaminate the sheath fluid. Do not let your fingers, paper tower, or other objects touch the sheath fluid.

- 14 Fill the sheath tank to the position ring of metal tube inside the sheath tank. Use IsoFLOW Sheath or ISOTON II sheath fluid. Refer to Filling the Sheath Tank in CHAPTER 11, Replacement/Adjustment Procedures.
- **15** Place the lid back on the sheath tank and tighten it.





Risk of personal injury. The full sheath tank is heavy. When placing the sheath tank back in the fluidics cart, use proper lifting techniques or seek assistance to reduce the likelihood of back injury.

16 Carefully put the sheath tank back into the fluidics cart.

17 Connect the quick connectors on the sheath tank.

Cleaning the Waste Container





Clean the waste container once a month.

IMPORTANT The waste container might get deformed if autoclave. However, one-time autoclave is necessary before you dispose of the waste container. Use the recommended settings for the autoclave:

• Autoclave temperature: 115 °C;

Pressure: 15 PSI;

Duration: 30 minutes.

1 Select Standby.

Or

Shut down the system. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.

- 2 Disconnect the waste quick connectors on the connection panel of the fluidics cart.
- **3** Remove the waste container from the fluidics cart.

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WARNING

Risk of biohazardous contamination if you have skin contact with the waste container, its contents, and its associated tubing. The waste container and its associated tubing could contain residual biological material and must be handled with care. Clean up spills immediately.

Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.

4 Remove the cap together with the waste level sensor from the waste container.

♠ WARNING

Risk of biohazardous contamination if you have skin contact with the waste container, its contents, and its associated tubing. The waste container and its associated tubing could contain residual biological material and must be handled with care. Clean up spills immediately. Dispose of the contents of the waste container in accordance with your local regulations and acceptable laboratory procedures.

Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.

5 Empty the waste container.

! WARNING

Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

- **6** Add one liter of sodium hypochlorite solution with 0.5% active chlorine to the waste container.
- **7** Insert the waste level sensor back into the waste container and tightly close the waste container cap.
- **8** Let stand for 5 to 10 minutes.



Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

- **9** Dispose of the sodium hypochlorite solution in accordance with your local regulations and acceptable laboratory procedures.
- **10** Use deionized water to rinse the waste container and the waste harness. Ensure that there is no sodium hypochlorite residue.
- 11 Place the waste container back into the fluidics cart.
- **12** Connect the quick connectors.

Daily Decontamination During Shutdown

IMPORTANT The decontamination procedure varies according to your laboratory requirements, but the following information can be used as a guide.





Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.



Risk of personal injury from sharp edges or cutout. Use barrier protection, including protective eye wear, gloves, and suitable laboratory attire.



Risk of biohazardous contamination. Use barrier protection, including protective eye wear, gloves, and suitable laboratory attire. Dispose of the contents including swab, towel paper in accordance with your local regulations and acceptable laboratory procedures. Refer to the Safety Data Sheet for details about chemical exposure before using chemicals.

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At the end of the workday or before shutting down the instrument, use the following cleaning procedure to clean:

- Nozzle lift
- Bottom of cuvette
- Side stream illumination source
- Deflection plates
- Stream detection window
- Sort output holder
- Surfaces inside sort chamber
- Auxiliary door
- Sample station

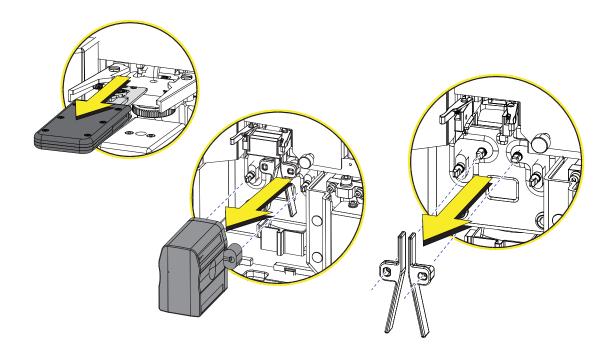
If a hazardous substance such as blood is spilled on the instrument, clean up the spill by using a 10% high-quality, fragrance-free, gel-free bleach solution, or use your laboratory decontamination solution. Then follow your laboratory procedure for disposal of hazardous materials. If the instrument needs to be decontaminated, contact us.



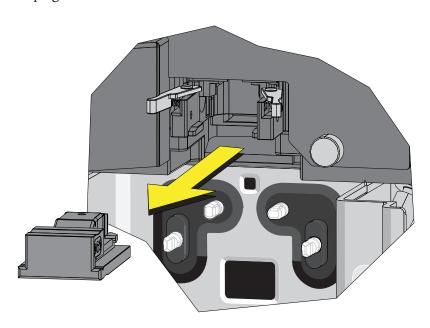
Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

- 1 Ensure the Sorter is powered off.
- **2** Open the sort chamber sliding door, and the sort protection door of the Sorter. See Figure 1.21.

Remove the nozzle module, the side stream illumination source, and the deflection plates.

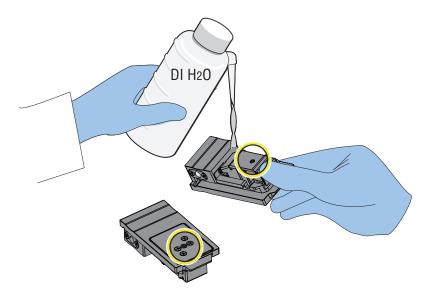


4 Unplug the nozzle lift from the Sorter.



10-54 C37808AA

5 Rinse all surfaces of the nozzle lift with DI water, especially for the central hole where the salt can easily accumulate.

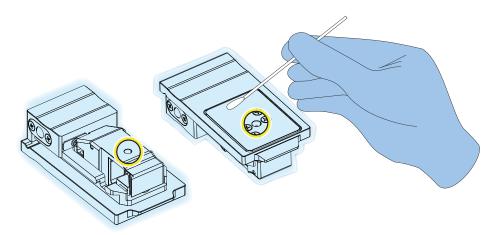


NOTE Use an ultrasonic cleaning device to clean the nozzle lift if necessary.

CAUTION

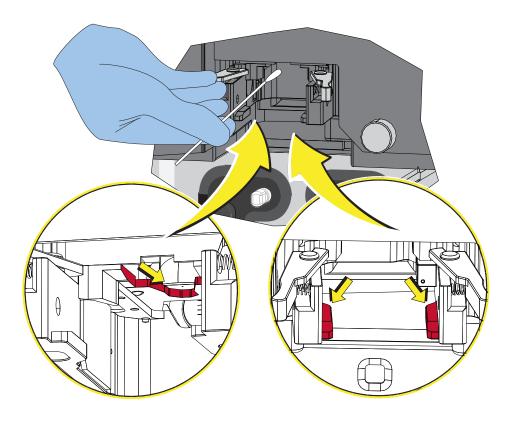
Risk of charge failure on the droplets if the nozzle lift contains water drops in the hole. To ensure good charge efficiency which affects the height of break-off point, dry the nozzle lift completely.

6 Dry the nozzle lift thoroughly with a clean swab.



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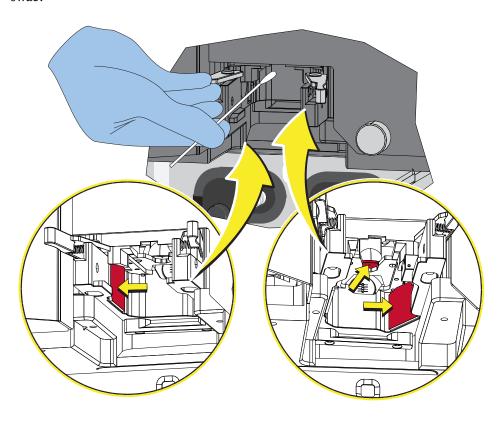
7 Wipe both the sliding rails for the nozzle lift, and the V-plate surface which touches the nozzle with the moistened swab.



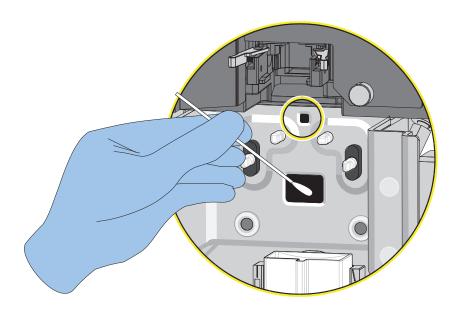
8 Apply a small amount of anhydrous alcohol to a clean swab.

10-56 C37808AA

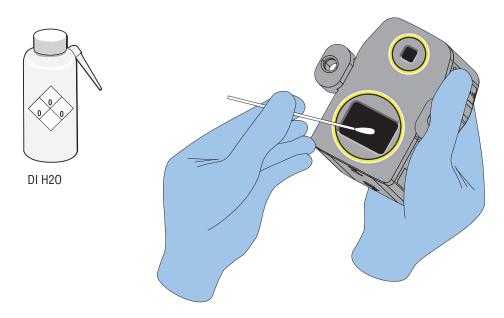
9 Gently wipe the bottom of the flow cell, and the optics protection glass with the moistened swab.



 ${f 10}$ Gently wipe the side stream detection window with the moistened swab.

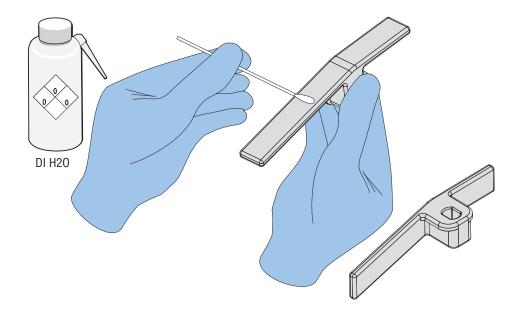


11 Gently wipe the side stream illumination source with the swab moistened with DI water.



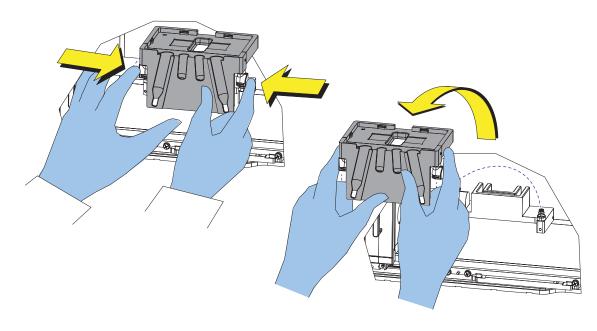
NOTE It is recommended to repeat this using the dustless paper moistened with anhydrous alcohol. Wipe the surface from one side to another.

12 Gently wipe the deflection plates with the moistened swab.

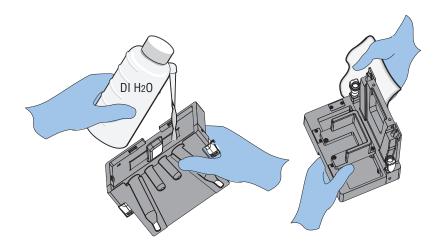


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13 Press the lock pins on the sides of the sort output holder and lift the sort output holder off the Cyclone movement system.



14 Rinse all surfaces of the sort output holder with DI water and dry it.

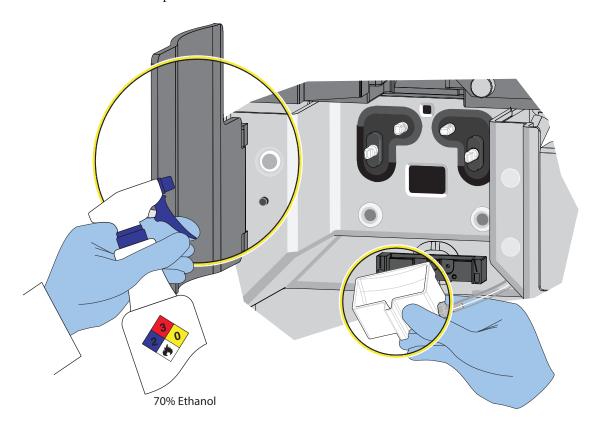


C37808AA

WARNING

Risk of fire hazard. Ethanol is a volatile liquid that cannot be used near a fire source.

15 Spray the waste catcher, the sort protection door, and all the surfaces inside the sort chamber with 70% ethanol and wipe clean.



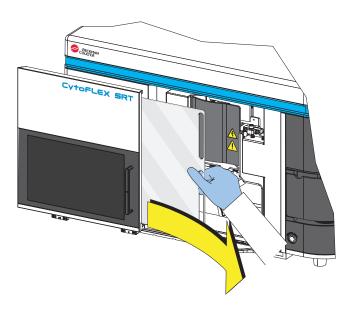
CAUTION

Risk of instrument damage. The sort module (flow cell) assembly can be damaged if the nozzle lift is not installed in the correct order. Ensure you install the nozzle lift BEFORE installing the nozzle to prevent damage to the sort module (flow cell) assembly.

16 Reinstall the nozzle lift, deflection plates, side stream illumination, and the sort output holder.

10-60 C37808AA

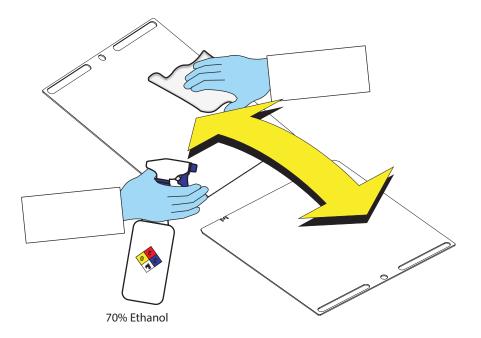
17 Remove the auxiliary door.



! WARNING

Risk of fire hazard. Ethanol is a volatile liquid that cannot be used near a fire source.

18 Spray both surfaces of the auxiliary door with 70% ethanol and wipe clean.

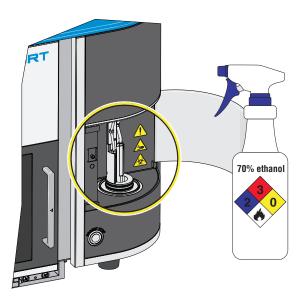


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WARNING

Risk of fire hazard. Ethanol is a volatile liquid that cannot be used near a fire source.

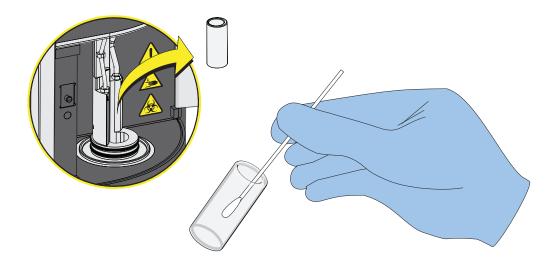
19 Spray all the surfaces of the sample station with 70% ethanol and wipe clean.



MARNING

Risk of fire hazard. Ethanol is a volatile liquid that cannot be used near a fire source.

20 Wipe the sample tube holder with 70% ethanol.



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21 If the optional Biosafety Cabinet is installed, clean the Biosafety Cabinet according to the manufacturer's instructions. See APPENDIX C, Instrument Inside Biosafety Cabinet.

Nonscheduled Cleaning

IMPORTANT Weekly and monthly preventative maintenance will be determined by the requirements of your laboratory. In most cases, the Fluidics Decontamination procedure should be run on a yearly basis; however, individual laboratory needs may vary.

A Beckman Coulter Field Service Representative should perform a preventative maintenance check on the instrument once a year. To schedule an annual preventative maintenance service, contact us.

Biosafety Cabinet

For maintenance information regarding the optional Biosafety Cabinet, refer to Biosafety Cabinet product manual or contact the manufacturer, see APPENDIX C, Instrument Inside Biosafety Cabinet.

Cleaning Procedures Nonscheduled Cleaning

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Replacement/Adjustment Procedures

Overview

This chapter describes how to carry out certain routine and nonscheduled maintenance procedures. Proper maintenance can help extend the service life of the instrument and ensure experimental accuracy. When conducting any maintenance work, take all necessary biosafety precautions.

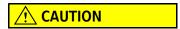
IMPORTANT In addition to parts specifically discussed, for all replacement parts, use only parts provided by Beckman Coulter to ensure proper functioning of the instrument. Never disassemble any part of the instrument without prior authorization. Beckman Coulter assumes no responsibility for any instrument problems resulting from the use of any part not authorized by Beckman Coulter for use with the instrument.

This chapter contains information on:

- Routine Replacement/Adjustment
 - Removing/Installing the Nozzle Module
 - Filling the Sheath Tank
 - Filling the Shutdown Fluid Container
 - Emptying the Waste Container
 - Replacing the Waste Air Filter
 - Replacing the Sheath Fluid Filter
 - Replacing the Debubble Filter
 - Replacing the Shutdown Fluid Filter
 - Replacing the Aseptic Cleaning Solution Filter
 - Managing the Maintenance Reminder
 - Removing Trapped Air Bubbles
- Nonscheduled Replacement/Adjustment
 - Replacing the O-Ring
 - Replacing the Nozzle
 - Replacing the Sample Probe
 - Replacing the Sample Line
 - Changing the Event Rate Setting
 - Setting Laser Delay
 - Replacing the Optical Filter
 - Changing the Stream Mode
 - Calibrating the Sample Line Bubble Detector
 - Resetting the Sheath Tank Scale

Routine Replacement/Adjustment

Removing/Installing the Nozzle Module



Risk of damage to the nozzle.

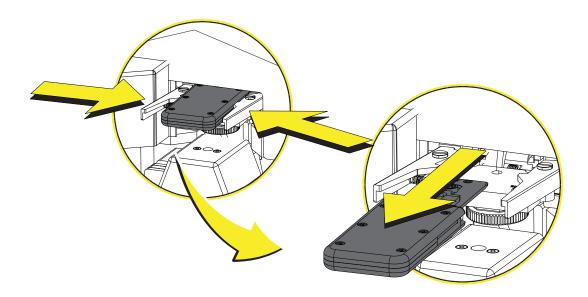
- When cleaning or replacing the nozzle, always handle with care to prevent the nozzle module from falling.
- Do not touch the nozzle. Touching the nozzle can soil and/or scratch the nozzle.



Risk of damage to the flow cell. Ensure that you have stopped the sheath flow prior to removing or installing the nozzle module.

Removing the Nozzle Module

- 1 Select **Standby** to turn off sheath.
- **2** Open the sort chamber sliding door and the sort protection door to access the nozzle module. Refer to Figure 1.21.
- **3** Remove the nozzle module by pushing the metal release clamps inwards.

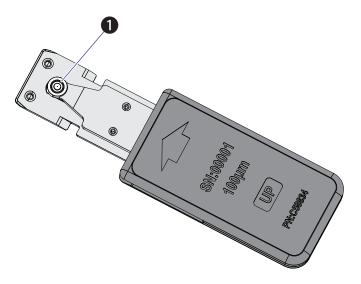


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4 Clean the nozzle. For instructions on cleaning the nozzle, refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures.

Installing the Nozzle Module

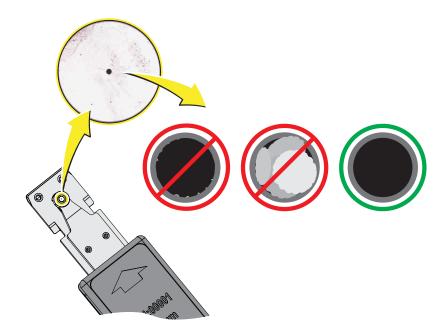
- 1 Select **Standby** to turn off sheath.
- **2** Open the sort chamber sliding door and the sort protection door. Refer to Figure 1.21.
- **3** Verify that the black O-ring (1) is securely seated on the nozzle module.



NOTE If the O-ring is deformed or degraded, install a new O-ring. For instructions, refer to Replacing the O-Ring in CHAPTER 11, Replacement/Adjustment Procedures.

IMPORTANT For best sorting results, ensure that both sides of the nozzle are clean and dry.

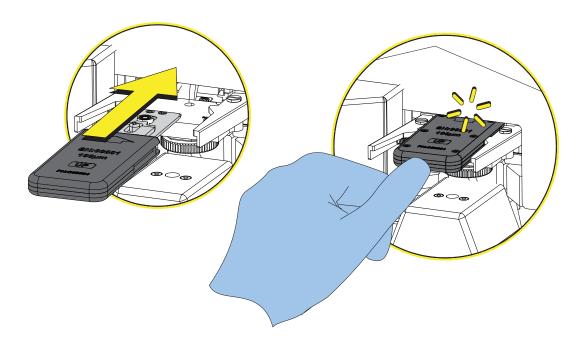
4 Visually inspect the nozzle under magnification for salt crystals or cellular debris. If there is any debris, clean the nozzle first. For instructions, refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures.



NOTE The inner of a good nozzle should be a perfect circle and free of any debris.

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5 Insert the nozzle module carefully into Sorter with the UP symbol facing up. The nozzle module is locked into its position when you hear a click.



6 Close the sort protection door and the sort chamber sliding door.

Filling the Sheath Tank

When the Sheath status indicator turns yellow or red, fill the sheath tank.



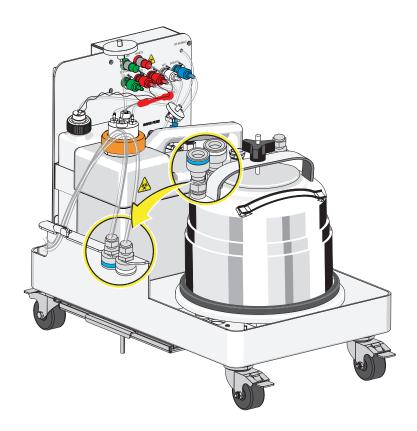
Misleading results could occur if you use the wrong sheath. Beckman Coulter recommends using IsoFlow Sheath Fluid or the ISOTON II to ensure system performance. Refer to Table B.1 in APPENDIX B, Consumables for the recommended sheath.

NOTE It is recommended to fill the sheath tank at the end of the workday to avoid introducing tiny air bubbles if the Sorter will be used the next day.

1 Shut down the system. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.

NOTE If the system is already in the idle state, skip to Step 2.

2 Disconnect the sheath outlet connector and the air inlet connector from the sheath tank.

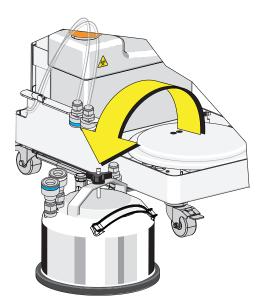


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CAUTION

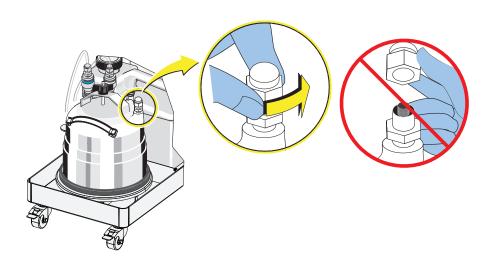
Risk of instrument damage. Remove the sheath tank from the Fluid Cart and fill away from the instrument to prevent spills that could damage the instrument circuitry.

Remove the sheath tank from the fluidics cart.



4 Optional: Twist the pressure release valve anti-clockwise to release the pressure of sheath tank. You will hear the pressure escaping (a hissing sound).

NOTE The core of pressure release valve is likely to drop. Do not remove the pressure release valve from the sheath tank. Once the pressure is released completely, re-tighten the pressure release valve.



IMPORTANT Ensure the pressure in the sheath tank is completely released otherwise you cannot remove the lid. If this occurs, proceed Step 4 to manually release the sheath pressure first.

Remove the lid from the sheath tank (rotate counter-clockwise). To prevent soiling the sheath fluid, do not touch the inside of the lid and set the lid aside on a clean surface such as a paper towel.



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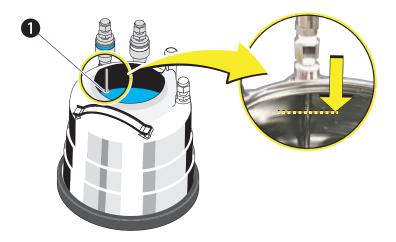
CAUTION

Risk of chemical hazard. Take care not to overfill the sheath tank. Clean up spills immediately. Use barrier protection including gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

CAUTION

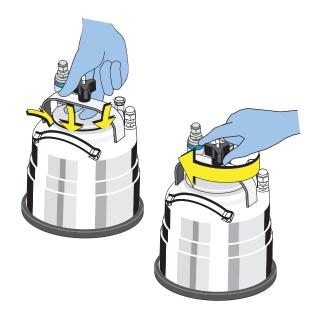
Risk of clogging the sheath line. Contaminated sheath can shorten the service life of the sheath fluid filter. Take care not to contaminate the sheath fluid. Do not let your fingers, paper tower, or other objects touch the sheath fluid.

6 Fill the sheath tank to the position ring (1) of metal tube inside the sheath tank.



IMPORTANT Ensure that the O-ring of the lid completely seals the sheath tank. Any gap between the sheath tank and the lid might impact the sheath pressure stability.

7 Place the lid back on the sheath tank and tighten it.



⚠ WARNING

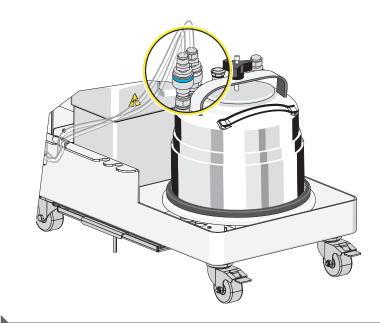
Risk of personal injury. The full sheath tank is heavy. When placing the sheath tank back in the Fluidics cart, use proper lifting techniques or seek assistance to reduce the likelihood of back injury.

8 Put the sheath fluid tank back into the Fluidics Cart.

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IMPORTANT Ensure that the color rings on the quick connector match the colors of the nut.

9 Plug into the sheath outlet connector and the air inlet connector. You will hear a click when the quick connector is securely connected.



Filling the Shutdown Fluid Container

IMPORTANT Use the CytoFLEX SRT Shutdown fluid for the shutdown fluid container.

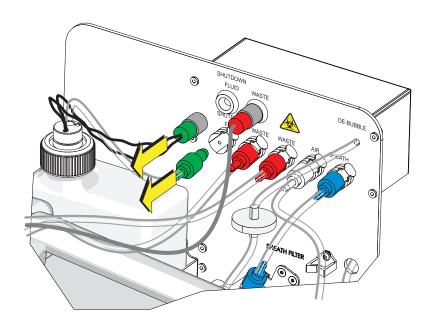
Use this procedure to fill the shutdown fluid container.

1 Select **Standby**.

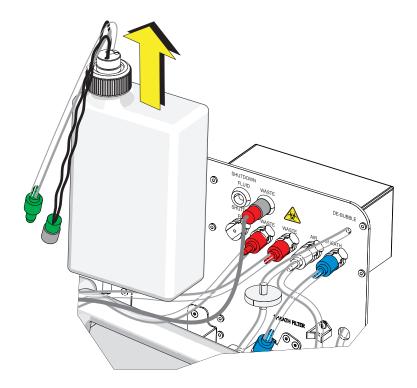
Or

Shut down the system. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.

2 Disconnect the Shutdown fluid level sensor connector and the Shutdown fluid connector from the Fluidics cart.

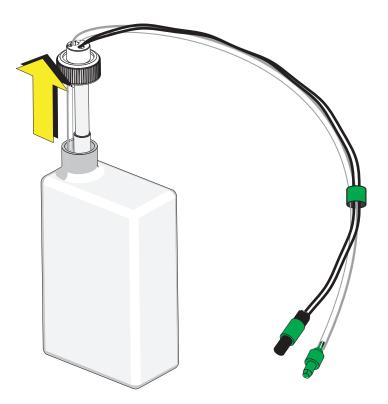


3 Take the shutdown fluid container out of the Fluidics cart.



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4 Unscrew the cap of the shutdown fluid container.



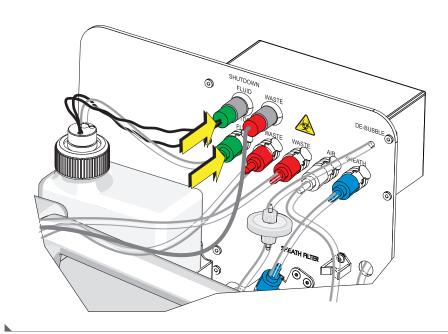
CAUTION

Risk of chemical hazard. Take care not to overfill the shutdown fluid container. Clean up spills immediately. Use barrier protection including gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

- **5** Carefully pour CytoFLEX SRT Shutdown fluid into the shutdown fluid container, filling it below the bottom of the neck (approximately 1 L). For the approved list of cleaners, refer to Approved Cleaners and Disinfectants.
- 6 Screw the cap back onto the shutdown fluid container.
- 7 Put the shutdown fluid container back into the Fluidics cart.

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f 8 Connect the level sensor connector and the Shutdown fluid connector on the Fluidics cart.



Emptying the Waste Container







Risk of biohazardous contamination if you have skin contact with the waste container, its contents, and its associated tubing. The waste container and it associated tubing might container residual biological material and must be handled with care. Clean up spills immediately. Dispose of the contents of the waste container in accordance with your local regulations and acceptable laboratory procedures.

Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.

If the Waste status indicator turns yellow, empty the waste container as soon.

NOTE When the waste flow indicator turns red, the system stops the fluid and goes into Standby immediately.

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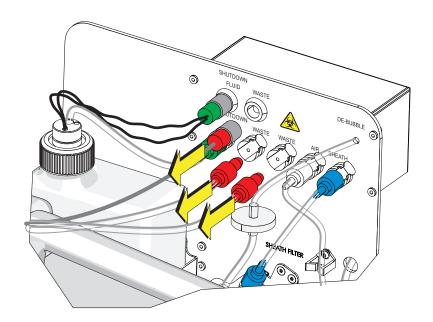
1 Select Standby.

Or

Shut down the system. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.

NOTE Skip this step if the instrument is in the Standby state.

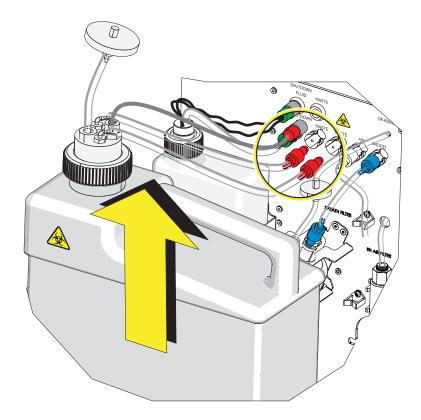
2 Disconnect the waste tubing connectors from the Fluidics cart.



MARNING

Risk of personal injury. The full waste container is heavy. Use proper lifting techniques or seek assistance to reduce the likelihood of back injury.

3 Take the waste container out of the Fluidics cart.



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4 Remove the waste cap.



5 Empty the waste container according to your laboratory's procedures.

NOTE Dispose of waste in accordance with the local regulations and acceptable laboratory practice.

NOTE Take proper precautions to avoid spills if you are emptying the waste container into a sink, drain, or larger container. When moving the waste container to dispose of its contents, be sure the cap is secure to avoid spills.

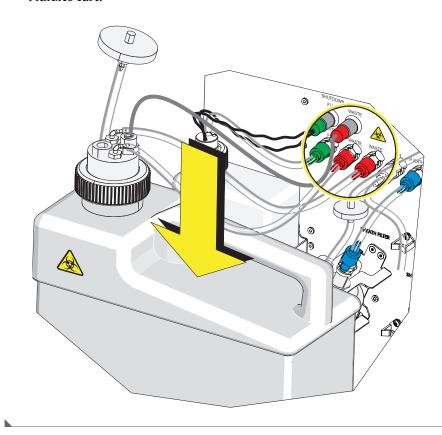
WARNING

Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eyewear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

- **6** Add approximately 400 mL high-quality, fragrance-free, gel-free bleach (5 to 6% solution of sodium hypochlorite available chlorine) to the waste container to reduce the risk of contamination if biohazardous samples are used for data collection. For the approved list of disinfectants, refer to Approved Cleaners and Disinfectants.
- 7 Screw the waste cap back in the waste container.

NOTE Properly dispose of the leakproof disposable container used in Step 5 after you screw the cap back on the waste container.

Put the waste container back into the Fluidics cart and connect the waste connections on the Fluidics cart.



Replacing the Waste Air Filter





Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.

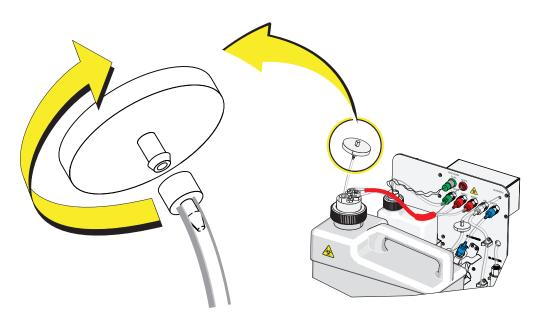
WARNING

Risk of biohazardous contamination if you have skin contact with the waste container, its contents, and its associated tubing. The waste container and its associated tubing might contain residual biological material and must be handled with care. Clean up spills immediately. Dispose of the waste parts in accordance with your local regulations and acceptable laboratory procedures.

The waste air filter is located at the waste container. Refer to Figure 1.10. It is recommended to replace the waste air filter every month or sooner if the waste container gets swelled or the waste air filter gets wet, or the liquid is split from the waste catcher.

NOTE Replace the waste air filter with a new one every time when you need perform the Aseptic Cleaning program, or the Long Term Shutdown program.

- 1 Select Standby.
- **2** Unscrew the waste air filter from the waste container.



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IMPORTANT Ensure that the INLET side of waste air filter is towards the waste container. The upside down installation of the waste air filter will degrade the filtering performance.

3 Connect the waste air tubing to the INLET side of a new filter.



4 Reset the maintenance reminder tracker. Refer to Managing the Maintenance Reminder.

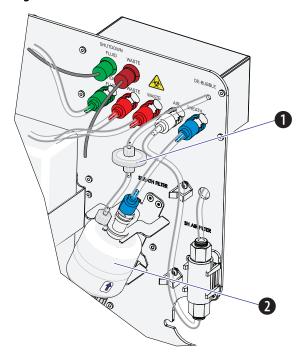
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Replacing the Sheath Fluid Filter

IMPORTANT The sheath fluid filter and the aseptic cleaning solution filter look the same. Do not mix use them. It is recommended to put the corresponding label on the sheath fluid filter to avoid mistake. You can find the corresponding labels in the CytoFLEX SRT instrument package.

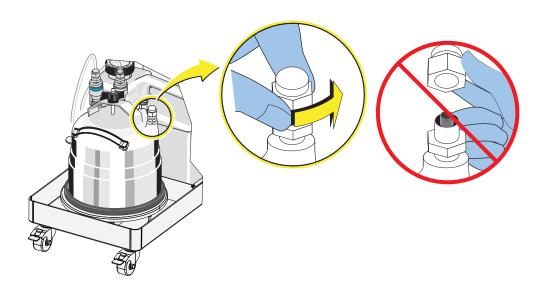
It is recommended to replace the sheath fluid filter every six months or sooner as needed. The life of the sheath fluid filter is related to the quality of the sheath fluid used. If impurities are found in the light scatter pattern, replace the sheath fluid filter. Refer to Figure 11.1.

Figure 11.1 Sheath Fluid Filter and De-bubble Filter

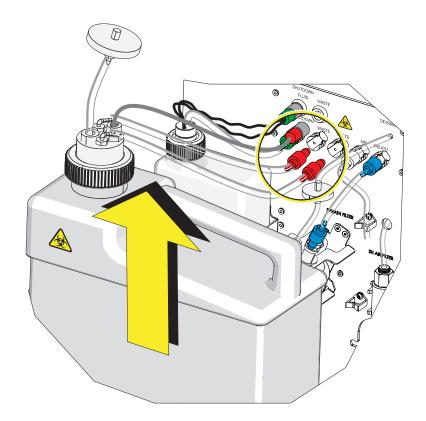


- 1. De-bubble filter
- 1. Sheath fluid filter
- 1 Run System Shutdown program. Refer to Running Shutdown Program in CHAPTER 8, Shutting Down the System.
- **2** Verify that the pressure in the sheath tank is completely relieved by loosening the pressure relief valve on the sheath tank.

You will hear the hissing if pressure exists inside the sheath tank. Re-tighten the pressure relief valve when the pressure is completely relieved.

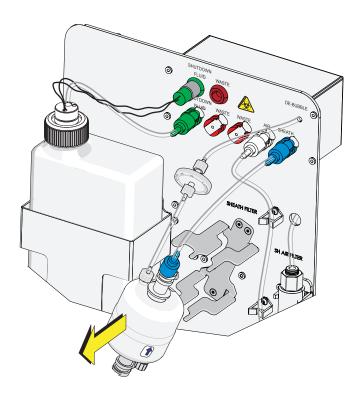


3 Disconnect the waste connections and remove the waste container from the Fluidics cart.

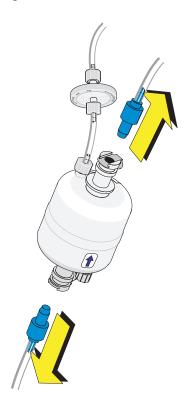


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4 Remove the sheath filter from the bracket on the Fluidics cart.



5 Compress the spring on the two quick connectors of the sheath fluid filter, and disconnect the quick connectors.



NOTE Dispose of the sheath fluid filter in accordance with your local regulations and acceptable laboratory procedures.

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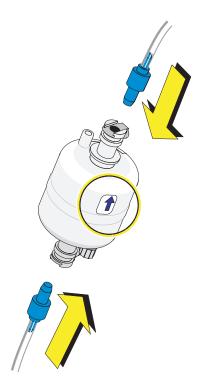
6 Unscrew the de-bubble tubing from the sheath fluid filter.



7 Remove the upper vent cap from a new sheath fluid filter.



8 Connect the sheath tubing to a new sheath fluid filter by the quick connectors.

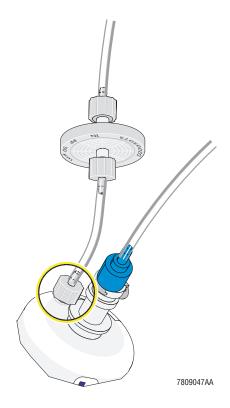


NOTE Ensure that the direction of the sheath flow matches with the indication arrow on the sheath filter.

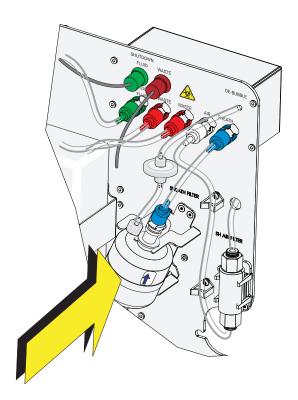
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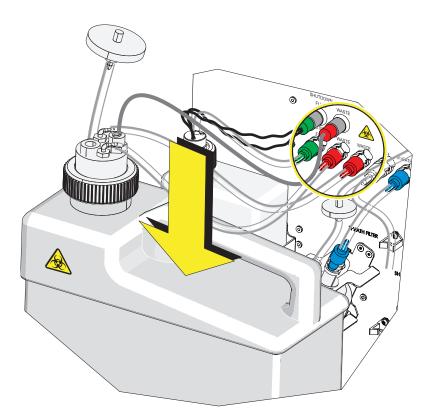
9 Screw the debubble tubing to the upper vent on the sheath fluid filter.



10 Attach the sheath filter to the filter bracket.



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11 Put the waste container back into the Fluidics cart and connect the waste connections.

- **12** Log into the software and run System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup.
- 13 Perform Sheath Filter debubble. Refer to Performing the Sheath Filter De-bubble.
- **14** Reset the maintenance reminder tracker. Refer to Managing the Maintenance Reminder.

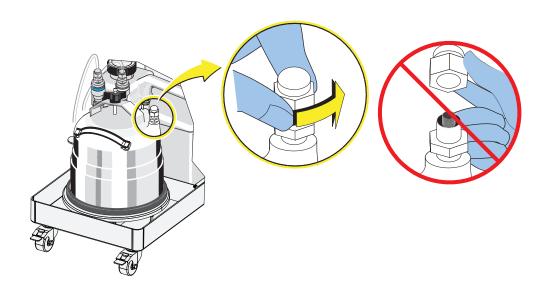
Replacing the Debubble Filter

It is recommended to replace the debubble filter every 12 months. The de-bubble filter is located on the sheath fluid filter. Refer to Figure 11.1.

Run System Shutdown program. Refer to Running Shutdown Program in CHAPTER 8, Shutting Down the System.

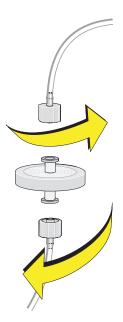
2 Verify that the pressure in the sheath tank is completely relieved by loosening the pressure relief valve on the sheath tank.

You will hear the hissing if pressure exists inside the sheath tank. Re-tighten the pressure relief valve when the pressure is completely relieved.



IMPORTANT Do not disconnect the debubble filter when the sheath tank is pressurized.

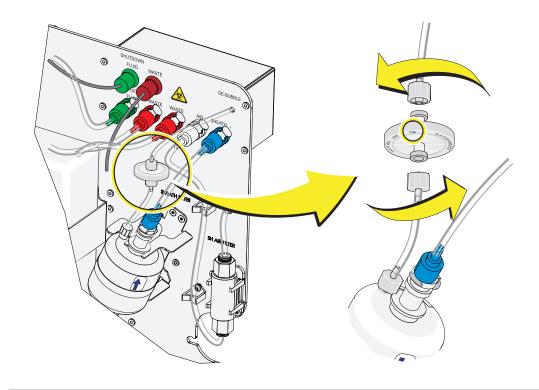
 $\bf 3$ Unscrew the tubing from the debubble filter.



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IMPORTANT Ensure that the INLET side of waste air filter is towards the sheath fluid filter. The upside down installation will degrade the filtering performance.

4 Connect a new debubble filter to the tubing.



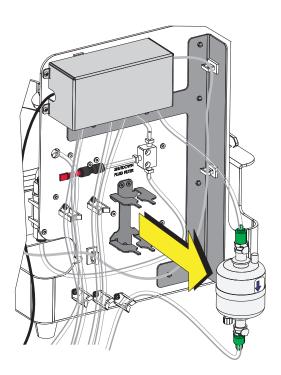
- **5** Log into the software and run System Startup Program. Refer to System Startup Program in CHAPTER 3, Daily Startup.
- **6** Perform Sheath Filter De-bubble. Refer to Performing the Sheath Filter De-bubble.
- 7 Reset the maintenance reminder tracker. Refer to Managing the Maintenance Reminder.

Replacing the Shutdown Fluid Filter

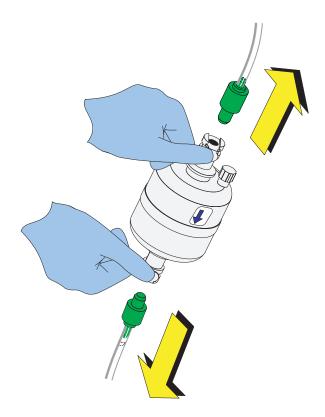
It is recommended to replace the Shutdown Fluid filter every 12 months. The Shutdown Fluid filter is located at the back of the Fluidics cart. Refer to Figure 1.5.

1 Select Standby.

2 Remove the Shutdown Fluid filter from the bracket on the back of the fluidics cart.

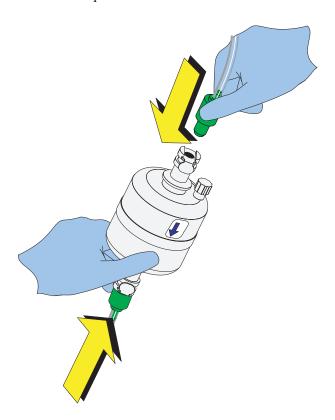


3 Compress the spring on the two quick connectors and disconnect the quick connectors.



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4 Connect the quick connectors to a new filter.



NOTE Ensure that the direction of the cleaning flow matches with the indication arrow on the filter.

- 5 Attach the Shutdown Fluid filter to the bracket.
- 6 Reset the maintenance reminder tracker. Refer to Managing the Maintenance Reminder.

Replacing the Aseptic Cleaning Solution Filter

IMPORTANT The aseptic cleaning solution filter and the sheath fluid filter look the same. Do not mix use them. It is recommended to put the corresponding label on the aseptic cleaning filter to avoid mistake. You can find the labels in the package.



The aseptic cleaning solution filter is dedicated for the Aseptic Cleaning program. It is recommended to replace the aseptic cleaning solution filter every twelve months. Note that the aseptic cleaning solution filter and the sheath fluid filter are interchangeable. Switch the aseptic cleaning solution filter to the sheath fluid filter after finishing the Aseptic Cleaning program.

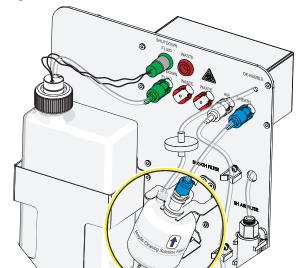


Figure 11.2 Aseptic Cleaning Solution Filter

For instructions on replacing the aseptic cleaning solution filter or switching from the sheath fluid filter to the aseptic cleaning solution filter, refer to Replacing the Sheath Fluid Filter.

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Managing the Maintenance Reminder

The maintenance reminder tracks the last maintenance date and initiates a reminder to complete maintenance for the following items:

- Flow Cell Clean
- Aseptic Clean
- Replacing sheath fluid filter
- Replacing waste air filter
- Replacing shutdown fluid filter
- Replacing de-bubble filter
- · Replacing aseptic cleaning solution filter

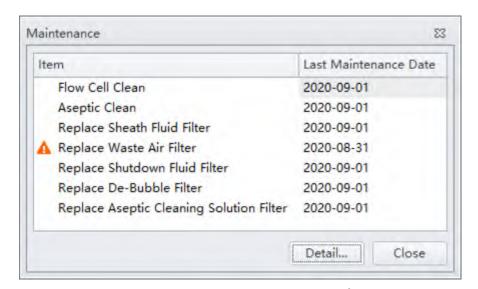
When parts have reached the designated use time limit in either days or number of uses, the

Maintenance Message icon Maintenance Message appears in the middle of the status bar.

1 Select the Maintenance Message icon Maintenance Message from the status bar to access the Maintenance window.

Or

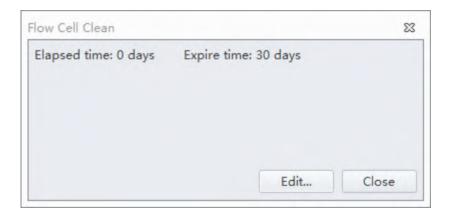
Select Maintenance in the Advanced menu. The Maintenance window appears.



NOTE The expired item appears with a warning triangle | 4 to the left of the item listed.

- **2** Select the desired item to manage, then choose one of the following:
 - To manage Flow Cell Clean, go to Step 3.
 - To manage Aseptic Clean, skip to Step 4.
 - To manage replacing sheath fluid filter, skip to Step 5.

- To manage replacing waste air filter, skip to Step 6.
- To manage replacing shutdown fluid filter, skip to Step 7.
- To manage replacing de-bubble filter, skip to Step 8.
- To manage replacing aseptic cleaning solution filter, skip to Step 9.
- 3 Select **Detail**. The Flow Cell Clean window appears.



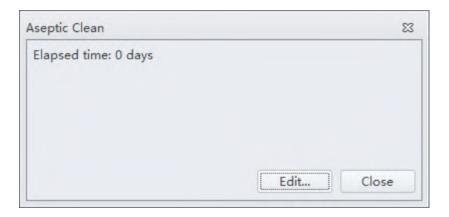
Select **Edit**. A pop-up window appears to reset the maintenance expire date.



NOTE The allowable range is 1-30 days.

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4 Select **Detail**. The Aseptic Clean window appears.

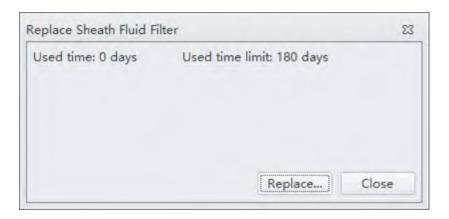


Select **Edit**. A pop-up window appears to reset the maintenance expire date.

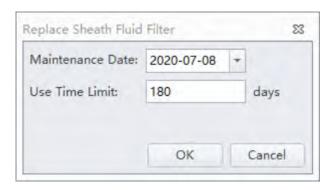


NOTE The allowable range is 1-30 days.

5 Select **Detail**. The Replace Sheath Fluid Filter window appears.

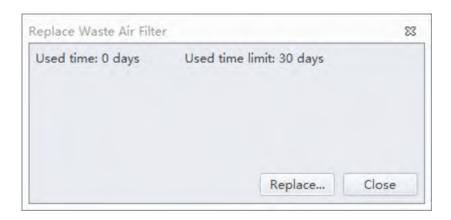


Select **Replace**. A pop-up window appears to reset the maintenance date as the current date that the maintenance was performed.

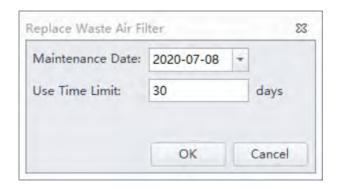


NOTE The allowable range is 1-180 days.

6 Select **Detail**. The Replace Waste Air Filter window appears.

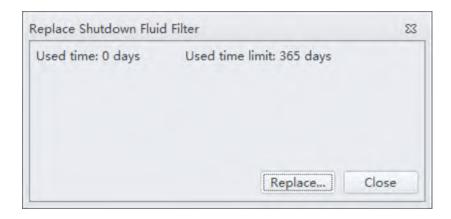


Select Replace. A pop-up window appears to reset the maintenance date as the current date that the maintenance was performed.

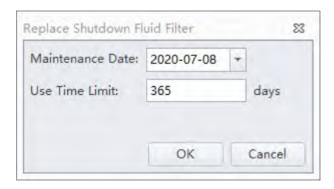


NOTE The allowable range is 1-30 days.

7 Select **Detail**. The Replace Shutdown Fluid Filter window appears.

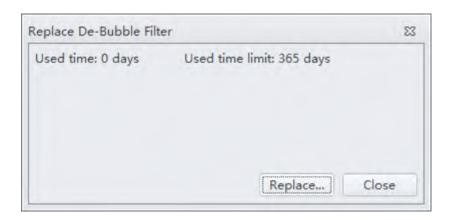


Select **Replace**. A pop-up window appears to reset the maintenance date as the current date that the maintenance was performed.

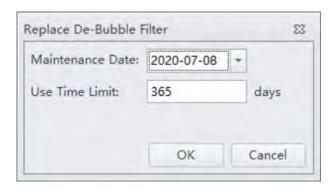


NOTE The allowable range is 1-366 days.

8 Select **Detail**. The Replace De-bubble Filter window appears.

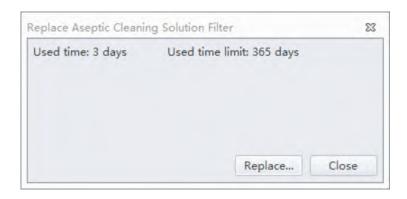


Select **Replace**. A pop-up window appears to reset the maintenance date as the current date that the maintenance was performed.

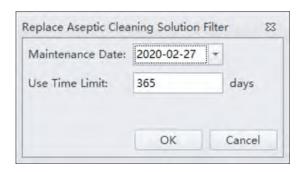


NOTE The allowable range is 1-366 days.

9 Select **Detail**. The Replace Aseptic Cleaning Solution Filter window appears.



Select **Replace**. A pop-up window appears to reset the maintenance date as the current date that the maintenance was performed.



NOTE The allowable range is 1-366 days.

Removing Trapped Air Bubbles

It is very important that the fluidics system is air-free before proceeding with sorting. Air bubbles can be introduced in the following cases:

- Perform Bubble Detector Calibration program.
- Perform Flow Cell Clean program.
- Perform Long Term Shutdown program.
- The O-ring is installed improperly.
- The instrument is on, but is unloading for more than 30 minutes.
- The sample runs empty.
- The ambient temperature fluctuates wildly.
- The instrument is not used for a long period of time.
- The instrument is being used for the first time.
- The sheath fluid is refilled.
- The sheath filter is replaced.

Failure of QC, signal drifts, or unstable break-off point may indicate the need to remove air bubbles.

The following procedure helps to eliminate the trapped bubbles. However, you can skip some or repeat more cycles according to your needs. Run the QC and Sort Calibration to verify that the bubbles are completely removed. If both QC and Sort Calibrations pass, it indicates that bubbles are completely eliminated and the system is ready for sorting. For analysis experiments, the Sort Calibration is unnecessary.

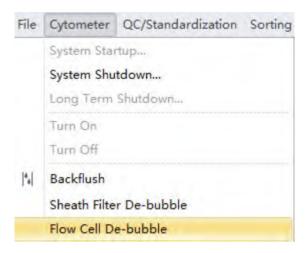
NOTE It is recommended to fill the sheath tank at the end of the workday to avoid introducing tiny air bubbles if the Sorter will be used the next day.

Performing the Flow Cell De-bubble

Select **Initialize** to put the instrument in the Ready state.

NOTE Skip this step if the instrument is already in the Ready state.

2 Select Flow Cell De-bubble from the Cytometer Menu to remove the bubble in the flow cell.



The status bar prompts that a Flow Cell Debubble is under way. Wait for the debubble process to finish.



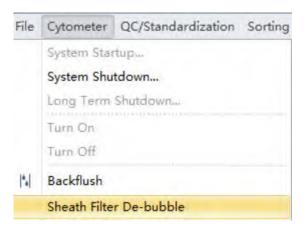
NOTE If necessary, repeat several cycles until the bubbles are completely eliminated.

Performing the Sheath Filter De-bubble

1 Select Initialize to put the instrument in the Ready state.

NOTE Skip this step if the instrument is already in the Ready state.

2 Select **Sheath Filter De-bubble** from the Cytometer Menu to remove the bubble in the sheath filter.



The status bar prompts that a Sheath filter debubble is under way. Wait for the debubble process to finish.



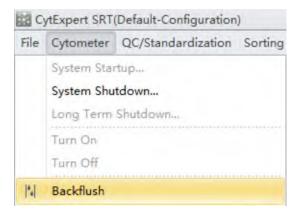
NOTE If necessary, repeat several cycles until the bubbles are completely eliminated.

Performing Backflush

1 Select Initialize to put the instrument in the Ready state.

NOTE Skip this step if the instrument is already in the Ready state.

2 Select Backflush from the Cytometer menu.



NOTE If necessary, repeat several cycles until the bubbles are completely eliminated.

Run QC and Sort Calibration to verify that the bubbles are removed. For instructions, refer to CHAPTER 4, Instrument Quality Control and Standardization, and Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting.

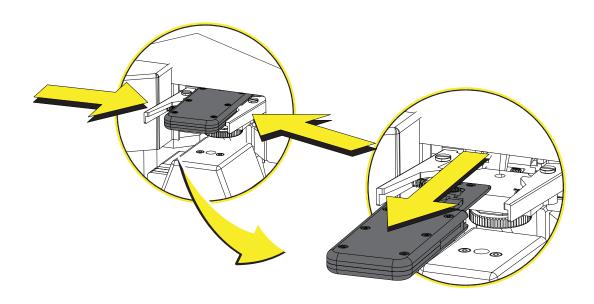
If QC and Sort Calibration pass, the system is ready for sorting.

If QC and Sort Calibration fail, proceed Cleaning the Nozzle and Cuvette Bottom.

NOTE If necessary, repeat Flow Cell De-bubble, Sheath Filter De-bubble, and Backflush until the bubbles are completely eliminated.

Cleaning the Nozzle and Cuvette Bottom

1 Remove the nozzle module.



- **2** Clean the nozzle. Refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures.
- **3** Wipe the bottom of Cuvette with a clean swab. Refer to Daily Decontamination During Shutdown in CHAPTER 10, Cleaning Procedures.
- **4** Run QC and Sort Calibration to verify that the bubbles are removed. For instructions, refer to CHAPTER 4, Instrument Quality Control and Standardization, and Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting.

If QC and Sort Calibration pass, the system is ready for sorting.

If QC and Sort Calibration fail, proceed System Shutdown and Restart.

System Shutdown and Restart

- 1 Shutdown the system. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.
- **2** Restart the system. Refer to System Startup Program in CHAPTER 3, Daily Startup.
- Run QC and Sort Calibration to verify that the bubbles are removed. For instructions, refer to CHAPTER 4, Instrument Quality Control and Standardization, and Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting.

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If QC and Sort Calibration pass, the system is ready for sorting.

If QC and Sort Calibration fail, proceed Step Sampling DI Water.

Sampling DI Water

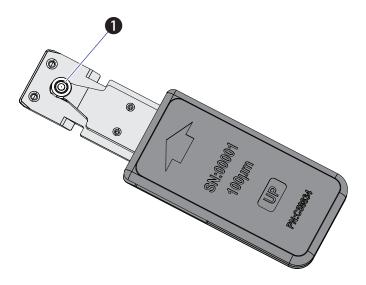
- 1 Restart the system. Refer to System Startup Program in CHAPTER 3, Daily Startup.
- 2 Sample DI water at 10 µL/min for 1 hour.
- Run QC and Sort Calibration to verify that the bubbles are removed. For instructions, refer to CHAPTER 4, Instrument Quality Control and Standardization, and Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting.

If the bubble problem persists, contact us.

Nonscheduled Replacement/Adjustment

Replacing the O-Ring

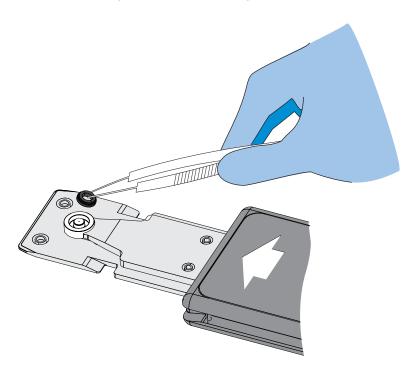
The O-ring (1) of the nozzle module is replaceable if the O-ring is damaged. It is recommended to replace the O-ring every month.



NOTE 10 spare O-rings are supplied in the CytoFLEX SRT accessory box.

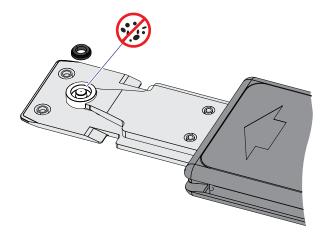
IMPORTANT Take care not to scratch the ceramic nozzle.

1 Pull out the O-ring from the nozzle using pointed tweezers or a pin.



IMPORTANT It is essential that the nozzle and the surrounding area are clean. Wipe the O-ring with a lint-free tissue and ethanol before installing the O-ring.

2 Ensure that the groove of O-ring is free of debris.

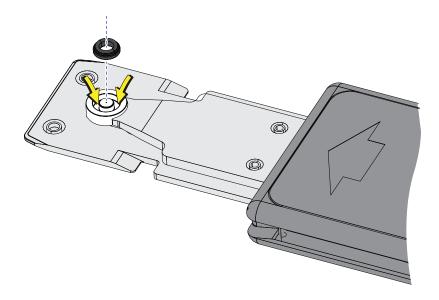


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IMPORTANT Ensure that the bigger circle of the O-ring faces down and the O-ring is fully in the groove.

3 Press the O-ring into the groove by a clean swab until the O-ring is completely seated into the groove.



4 Visually inspect the O-ring under magnification for debris or deformation.



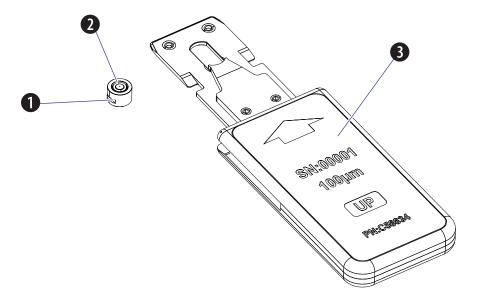
If there is any debris, clean the nozzle. For instructions, refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures.

If the O-ring is degraded or deformed, replace a new O-ring.

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Replacing the Nozzle

The nozzle (1) and the O-ring (2) are detachable from the nozzle holder (3). Replace the nozzle if it is clogged or damaged. Refer to APPENDIX B, Consumables for the part number of nozzle.



NOTE The entire nozzle module is an optional accessory that can be purchased separately.

IMPORTANT Take care when you compress the nozzle spring because the nozzle spring might bounce the nozzle off.

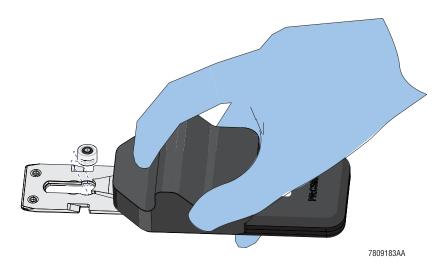
1 Use the dedicated tool to compress the nozzle spring all the way down to its limit and slide the nozzle out.



NOTE The dedicated tool is delivered together the CytoFLEX SRT accessory box. Keep the tool in a safe place for future use.

IMPORTANT The nozzle should be completely aligned with the slot.

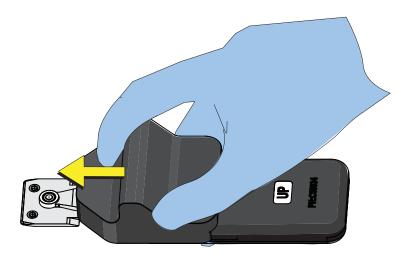
2 Insert the nozzle with the O-ring facing up into the slot of the nozzle holder.



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IMPORTANT Take care when you release the nozzle spring. Do not let the nozzle spring bounce the nozzle off.

3 Slide the nozzle to its end and release the spring slowly.



4 Fill a clean beaker with DI water and submerge the nozzle in the DI water. The DI water should be clean.



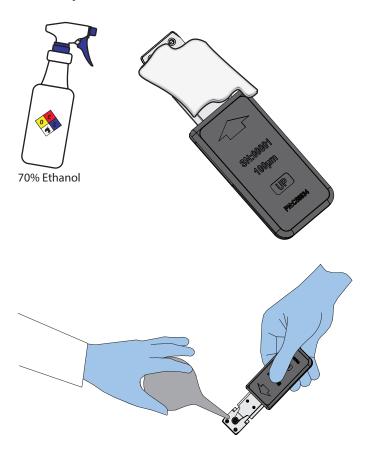
5 Use an ultrasonic cleaning device to clean the nozzle for 60 seconds.

! CAUTION

Risk of clogging the nozzle. Do not touch the nozzle by hand. The debris from your hand could clog the nozzle. A clogged nozzle could cause unstable fluid stream or obstruct the flow cell.

6 Take the nozzle module out of the DI water.

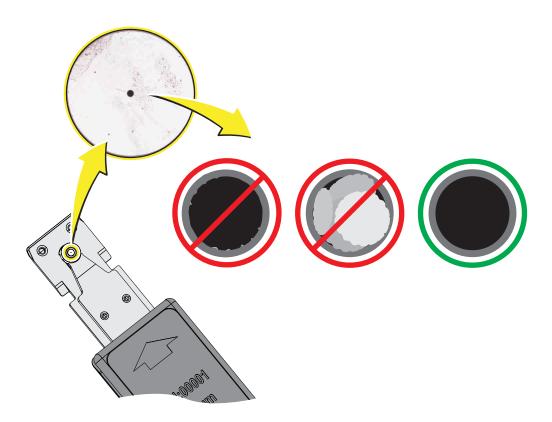
7 Wipe the nozzle with the lint-free tissue and ethanol. Then flush the nozzle using a squeeze bulb to dry the residual water.



NOTE Dry the nozzle completely, especially for the reverse side. Otherwise, the fluid stream might be off center.

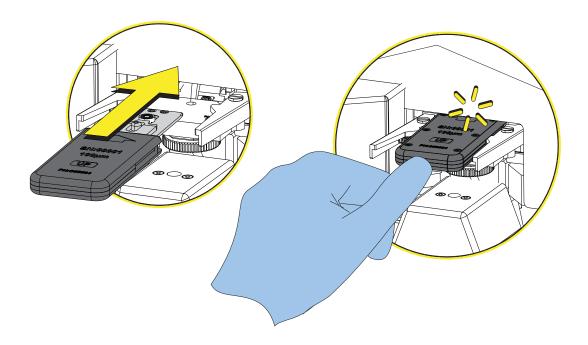
11-52 C37808AA

8 Visually inspect the nozzle under magnification for salt crystals or cellular debris. If there is any debris, clean the nozzle. For instructions, refer to Cleaning the Nozzle in CHAPTER 10, Cleaning Procedures.



NOTE The inner of a good nozzle should be a perfect circle and free of any debris.

9 Insert the nozzle module carefully into Sorter with the UP symbol facing up. The nozzle module is locked into its position when you hear a click.



10 Verify that the nozzle is installed properly by running QC and Sort Calibration. For instructions, refer to CHAPTER 4, Instrument Quality Control and Standardization, and Sort Calibration (Auto Drop Delay) in CHAPTER 5, Sorting.

If QC and Sort Calibration pass, the installation was successful.

If QC and/or Sort Calibration fails, follow the instructions in CHAPTER 9, Troubleshooting. If the problem persists, rotate the nozzle horizontally by 180° and repeat Steps 9-10. If this does not help, contact us.

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Replacing the Sample Probe





Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.



Risk of biohazardous contamination if you have skin contact with the sample probe or the sample tubing. The sample probe and the sample tubing could contain residual biological material and must be handled with care.

- Wear protective eye wear, gloves and suitable laboratory attire.
- · Clean up spills immediately.
- Dispose of the sample probe and the sample tubing in accordance with your local regulations and acceptable laboratory procedures.



Risk of personal injury. When reinstalling the sample probe, the exposed tip could puncture your skin. Wear protective gloves and suitable laboratory attire.

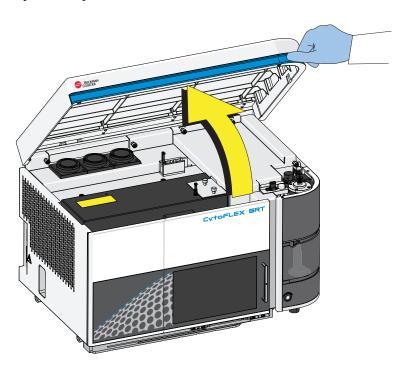
IMPORTANT The sample probe is autoclavable. Replace the sample probe only if it is bent or severely clogged.

It is recommended to replace the sample probe when it is severely clogged.

1 Select Standby.

NOTE Skip this step if the instrument is in the Standby state.

2 Open the top cover of the Sorter.

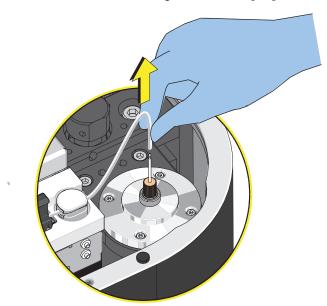


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WARNING

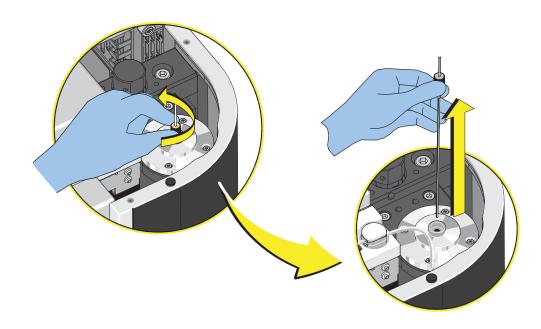
Risk of biohazardous contamination if you have skin contact with the sample probe or the sample tubing. The sample probe and the sample tubing could contain residual biological material and must be handled with care.

- Wear protective eye wear, gloves and suitable laboratory attire.
- · Clean up spills immediately.
- Dispose of the sample probe and the sample tubing in accordance with your local regulations and acceptable laboratory procedures.
- **3** Disconnect the silicone tubing from the sample probe.

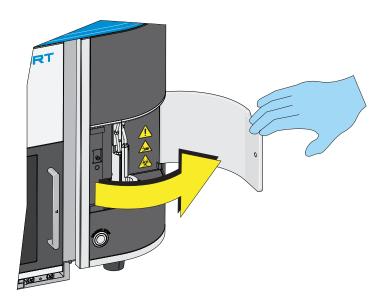


IMPORTANT Do not drop the sample probe while loosening the finger-tight fitting which is attached to the sample probe.

4 Turn the finger-tight fitting counter-clockwise and lift the sample probe together with the finger-tight fitting off the top plate.

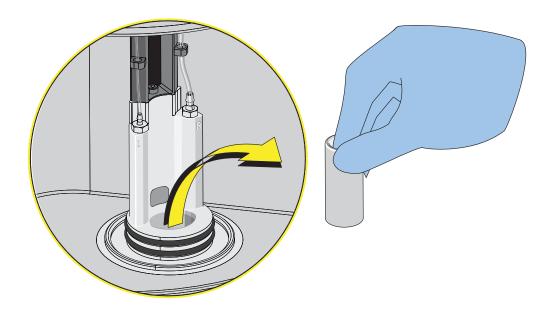


5 Open the sample station door.



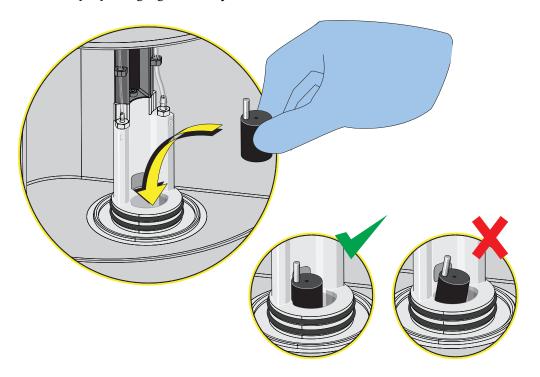
11-58 C37808AA

6 Remove tube holder from the sample station.



NOTE You need to use force because of the magnet under the tube holder.

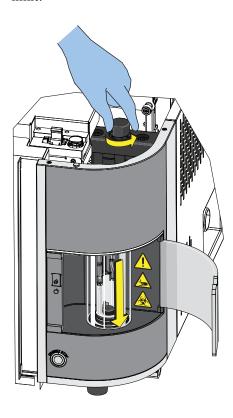
7 Put the sample probe gauge vertically in the tube holder slot.



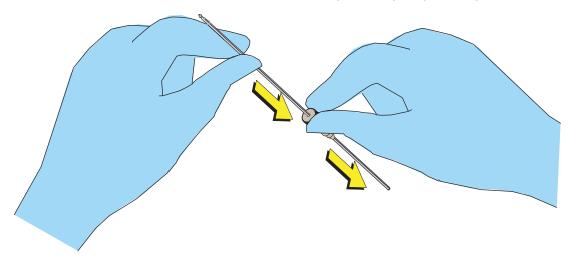
NOTE The sample gauge is for the height adjustment. It is delivered with the instrument package.

IMPORTANT Clean the sample station if necessary. A foreign object might block the chamber cover from moving downward to its limit.

8 Rotate the black thumbscrew counter-clockwise to move the chamber cover downward to its limit.



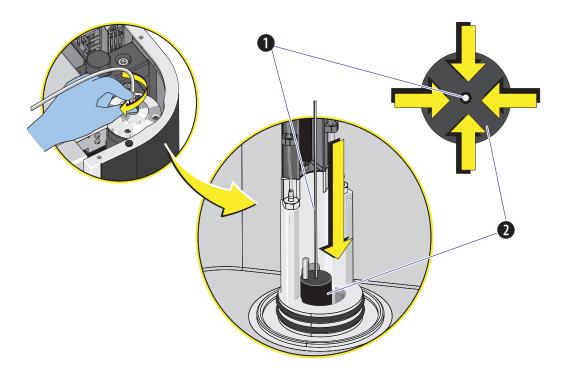
9 Feed the sample probe from the end without barb through the finger tight fitting.



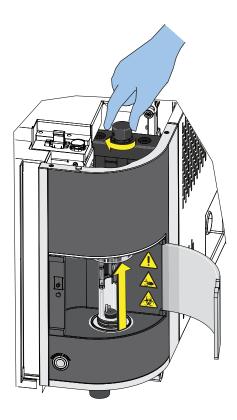
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IMPORTANT Take care not to bend the sample probe.

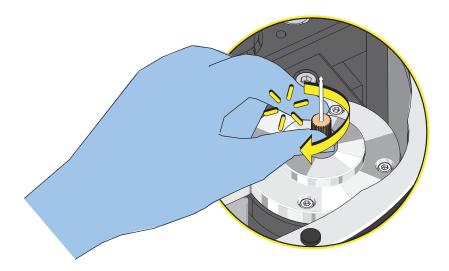
- Feed the sample probe vertically into the top plate.
- Do not use excessive force when you feel the sample probe is blocked by some object inside the sample chamber.
- The tip of sample probe should be in the center of the sample probe gauge.
- **10** Feed the sample probe (1) together with the finger tight fitting through the top plate. Turn the finger-tight fitting clockwise when the sample probe reaches the center hole of sample probe gauge (2).



11 Rotate the black thumbscrew clockwise to move the chamber cover upward to its limit.



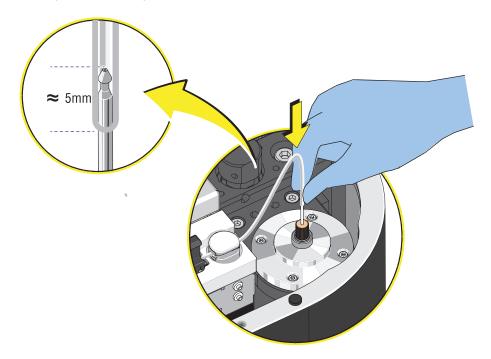
12 Verify that the finger-tight fitting is securely tightened to the top plate. You will hear a click if the finger-tight fitting is tightened to its limit.



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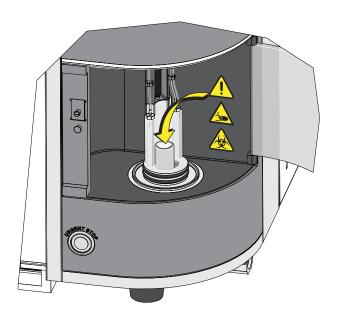
IMPORTANT The joint of the silicone tubing and sample probe is likely to contain debris. Beckman Coulter recommends cutting the old silicone tubing off by approximately 5 mm.

13 Slide the silicone tubing onto the hose barbed end of the probe. The tubing should cover the probe by approximately 5 mm.



NOTE Ensure to slide the silicone tubing onto the probe properly at the first attempt. Repeated attempts might scratch the silicone tubing. If necessary, cut the scratched silicone tubing off a little bit to avoid the potential clogging.

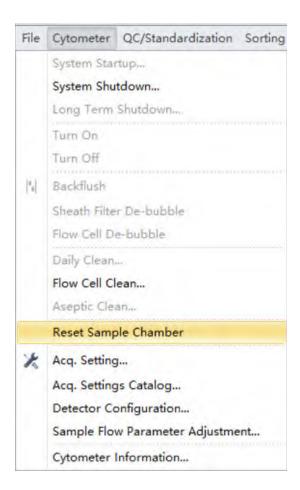
14 Remove the sample probe gauge and put the tube holder back in the tube holder slot.



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- **15** Close the sample station door.
- **16** Select **Reset Sample Chamber** from the Cytometer menu.



- 17 Select Initialize.
- 18 Select **Backflush** from the Cytometer menu.
- **19** Close the top cover of Sorter.

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Replacing the Sample Line





Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.



Risk of biohazardous contamination if you have skin contact with the sample probe or the sample tubing. The sample probe and the sample tubing could contain residual biological material and must be handled with care.

- Wear protective eye wear, gloves and suitable laboratory attire.
- Clean up spills immediately.
- Dispose of the sample probe and the sample tubing in accordance with your local regulations and acceptable laboratory procedures.



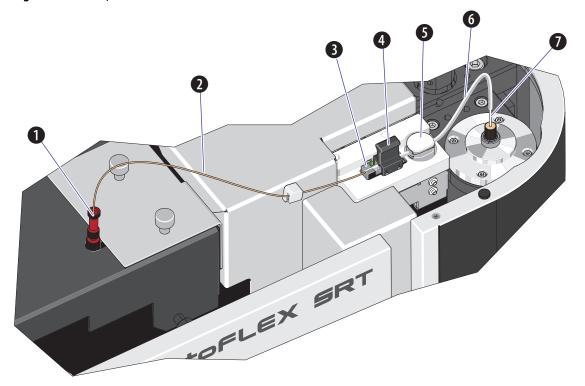
Risk of personal injury. When reinstalling the sample probe, the exposed tip could puncture your skin. Wear protective gloves and suitable laboratory attire.

Maintenance of the sample line is critical to the proper operation of system. It is recommended to replace the sample line when the sample line is contaminated or clogged. Degradation of the stability of the sample flow, and increase of the CV may indicate the need to replace the sample probe or the whole sample line. Refer to Figure 11.3.

For instructions on replacing the sample probe, refer to Replacing the Sample Probe. To replace the entire sample line, follow the instructions below.

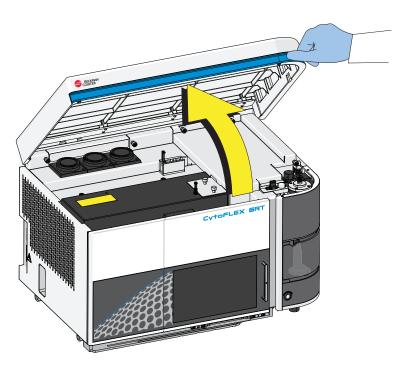
11-66 C37808AA

Figure 11.3 Sample Line

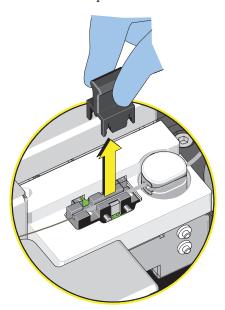


- 1. Finger-tight fitting
- 2. PEEK tubing
- 3. Sample line bubble detector
- **4.** Cap of the sample line bubble detector
- 5. Pinch valve
- 6. Silicone tubing
- 7. Sample probe
- Perform System Shutdown to put the system in idle state. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.
- **2** Turn off the main power switch on the lower-left corner of the Sorter.

3 Open the top cover of the Sorter.

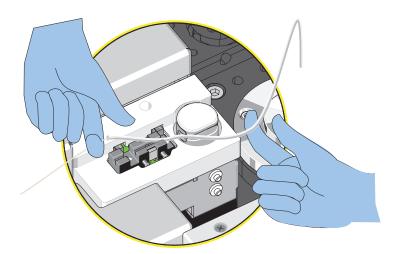


4 Remove the sample line bubble detector cap.



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5 Carefully pull the silicone tubing away from the sample line bubble detector and the pinch valve slot.



! WARNING

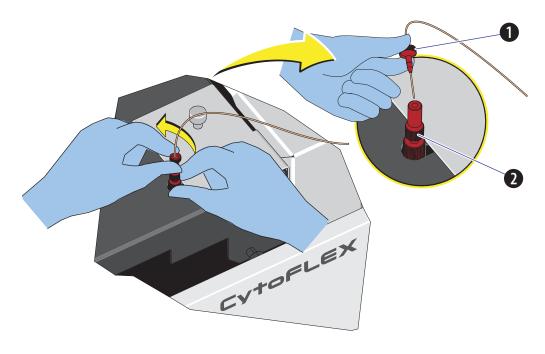
Risk of biohazardous contamination if you have skin contact with the sample probe or the sample tubing. The sample probe and the sample tubing could contain residual biological material and must be handled with care.

- Wear protective eye wear, gloves and suitable laboratory attire.
- · Clean up spills immediately.
- Dispose of the sample probe and the sample tubing in accordance with your local regulations and acceptable laboratory procedures.

! CAUTION

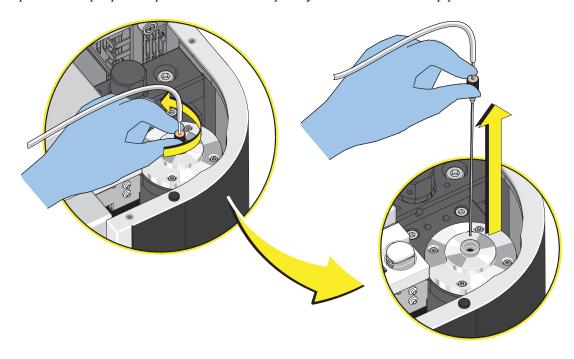
Risk of unstable sample flow rate if the finger tight fitting adapter is loose. Hold the fitting adapter securely when disconnecting or connecting the finger tight fitting.

6 Turn the brown finger-tight fitting (1) counter-clockwise to disconnect the PEEK tubing from the finger tight fitting adapter (2).



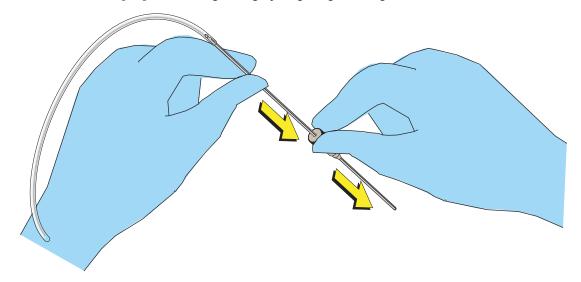
11-70 C37808AA

7 Turn the gray finger-tight fitting attached to the sample probe counter-clockwise and slowly pull the sample probe upward until it is completely removed from the top plate.

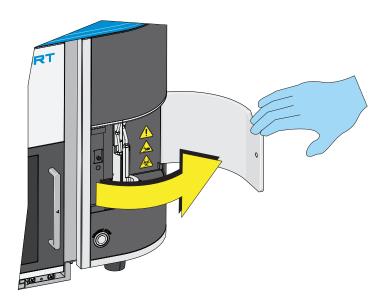


IMPORTANT A tiny piano wire is installed inside the new sample line to protect the sample probe from clogging. Remove this tiny piano wire when installing the new sample line.

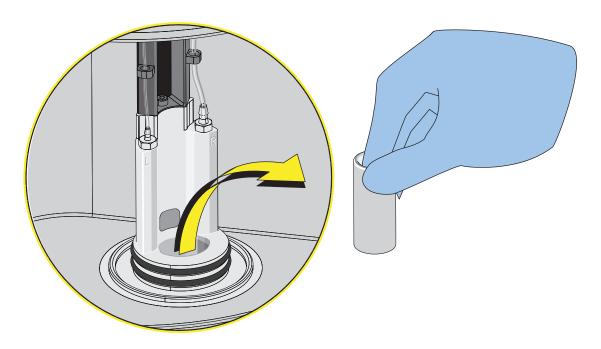
8 Feed the new sample probe through the gray finger tight fitting.



9 Open the sample station door.



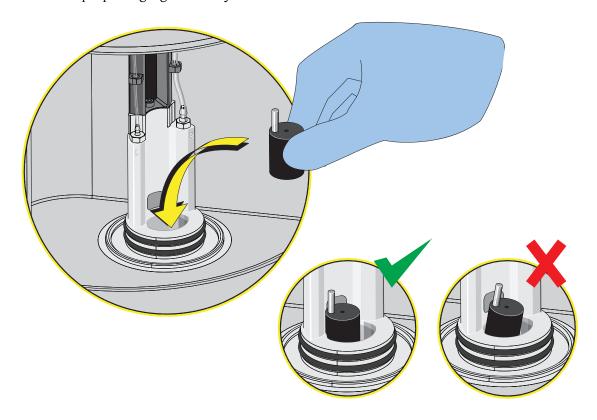
10 Remove tube holder from the sample station.



NOTE You need to use force because of the magnet under the tube holder.

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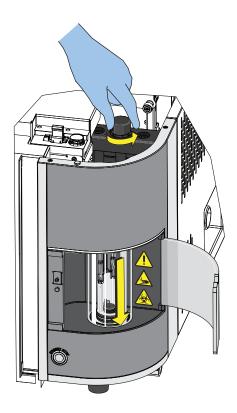
11 Put the sample probe gauge vertically in the tube holder slot.



NOTE The sample gauge is for the height adjustment. It is delivered with the instrument package.

IMPORTANT Clean the sample station if necessary. A foreign object could block the chamber cover from moving downward to its limit.

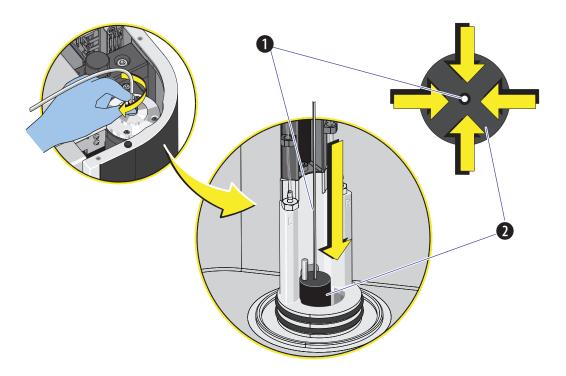
12 Rotate the black thumbscrew counter-clockwise to move the chamber cover downward to its limit.



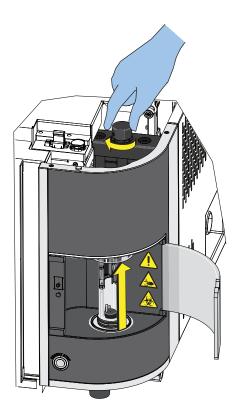
11-74 C37808AA

IMPORTANT Take care not to bend the sample probe.

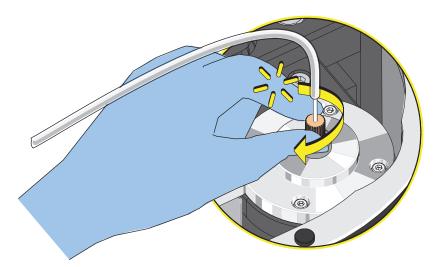
- Feed the sample probe vertically into the top plate.
- Do not use excessive force when you feel the sample probe is blocked by some object inside the sample chamber.
- The tip of sample probe should be in the center of the sample probe gauge.
- 13 Feed the sample probe together with the finger tight fitting through the top plate. Turn the finger-tight fitting clock-wise when the sample probe is into the center hole of sample probe gauge.



14 Rotate the black thumbscrew clockwise to move the chamber cover upward to its limit.

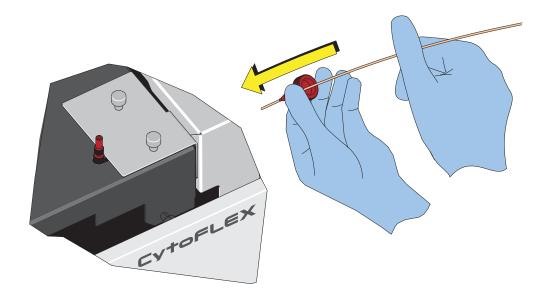


15 Verify that the finger-tight fitting is securely tightened to the top plate. You will hear a click if the finger-tight fitting is tightened to its limit.



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16 Verify that the brown finger-tight fitting is attached to the new PEEK tubing.



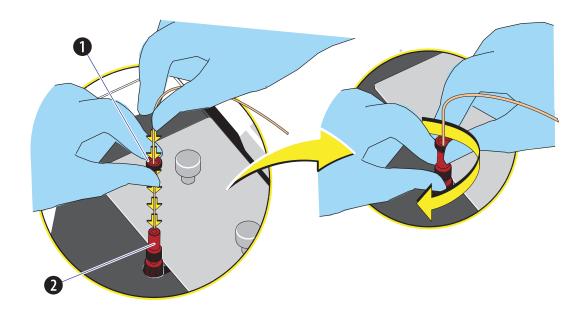
A CAUTION

Risk of fluid leakage or high carryover if the PEEK tubing is not securely connected to the flow cell.

CAUTION

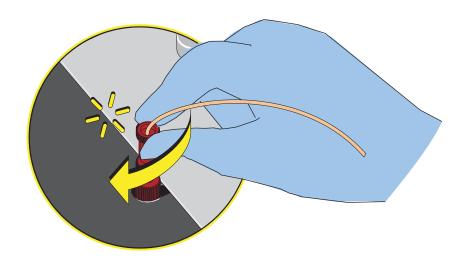
Risk of unstable sample flow rate if the finger tight fitting adapter is loose. Hold the fitting adapter securely when disconnecting or connecting the finger tight fitting.

17 Insert the PEEK tubing together with the finger-tight fitting (1) into the fitting adapter (2). Turn the finger tight fitting clockwise while pushing the PEEK tubing downwards to its limit.

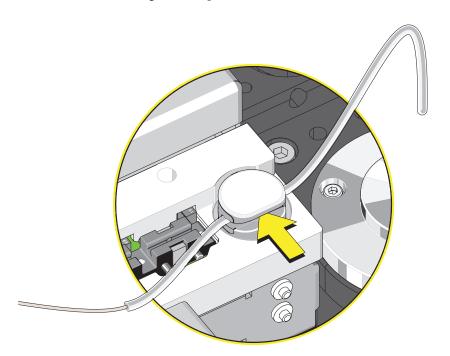


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18 Verify that the finger-tight fitting is completely tightened.



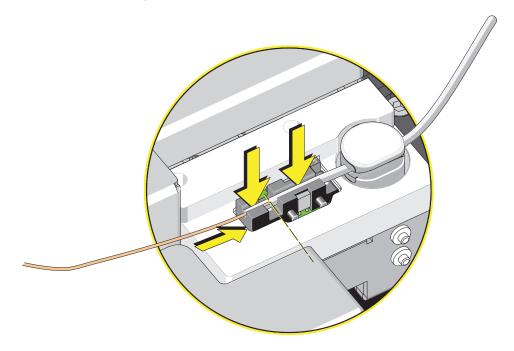
19 Push the silicone tubing into the pinch valve slot.



NOTE Ensure that the silicone tubing is completely seated to the bottom of the slot so that the pinch valve functions properly.

IMPORTANT The tubing joint should be completely into the groove of sample line bubble detector for better fluid stability.

 ${\bf 20}\,$ Push the silicone tubing into the sample line bubble detector slot.

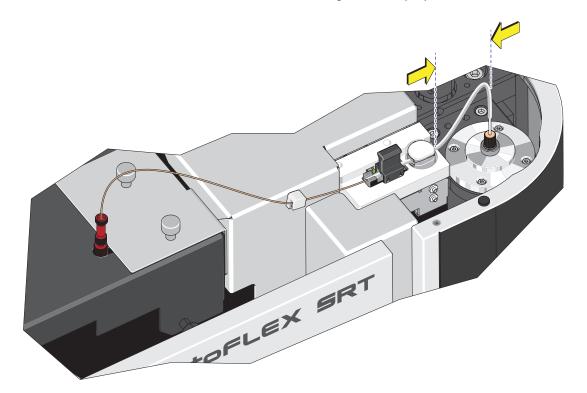


NOTE The PEEK tubing end should be in the middle as shown in the picture. Otherwise, the sample flow rate may be inaccurate and the bubble detector function may not work properly.

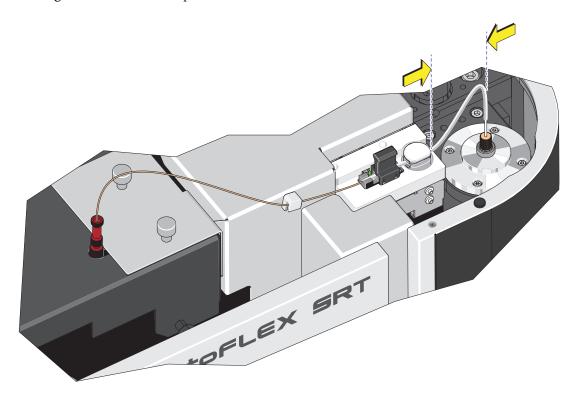
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21 Check for and remove any kinks in the tubing.

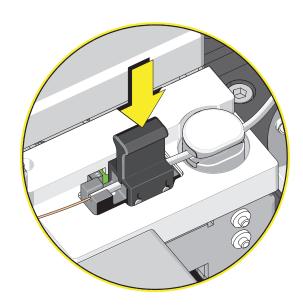
NOTE There should be a small amount of slack in the tubing on the sample probe.



22 Verify that the tubing length is sufficient to reach the pinch valve without tension when moving the chamber cover up or down.

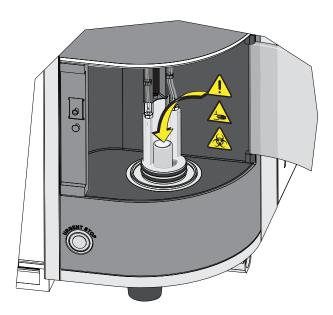


 ${\bf 23}\,$ Reinstall the sample line bubble detector cap.



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- **24** Close the top cover of the Sorter.
- **25** Remove the sample probe gauge and put the tube holder back in the tube holder slot.



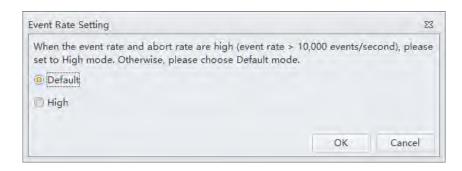
26 Restart the system. Refer to CHAPTER 3, Daily Startup.

27 Calibrate the sample line bubble detector. Refer to Calibrating the Sample Line Bubble Detector.

Changing the Event Rate Setting

The Event Rate Setting adjusts the collection setting around signal measurement so that the system is able to optimize the acquisition of events ensuring optimal sensitivity and processed events (%) when acquiring at higher event rates.

1 Select **Event Rate Setting** in the Advanced menu. The Event Rate Setting window appears.



2 Select **High** if the event rate is > 10,000 events/second.

Or

Select **Default** if the event rate is < 10,000 events/second.

3 Select **OK**.

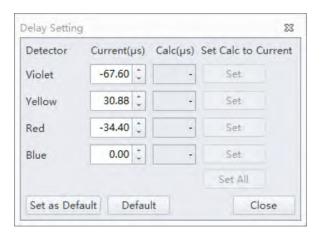
Setting Laser Delay

Laser delay is preset for QC. Only change the laser delay if the software prompts you that there is a difference in the actual delay and the default delay.

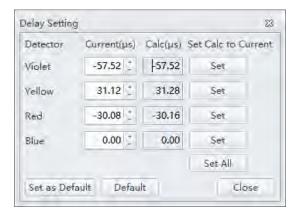


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Select **Delay Setting** from the Advanced menu. The Delay Setting window appears.



2 Set the current to the actual delay for the specified detector stated in the QC error message received.



- 3 Select Set as Default.
- 4 Select Close.

Replacing the Optical Filter

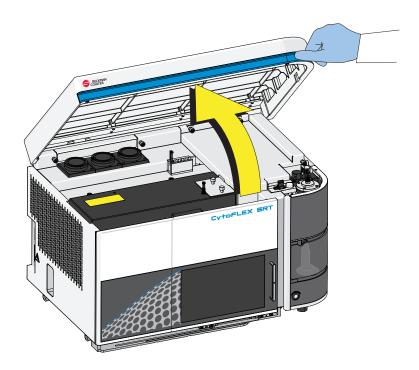
When the optical filter is damaged or it is required to use an optical filter with a non-standard wavelength, you must replace the optical filter yourself. For the specific part number of the optical filter, contact us.

1 Select Standby.

Or

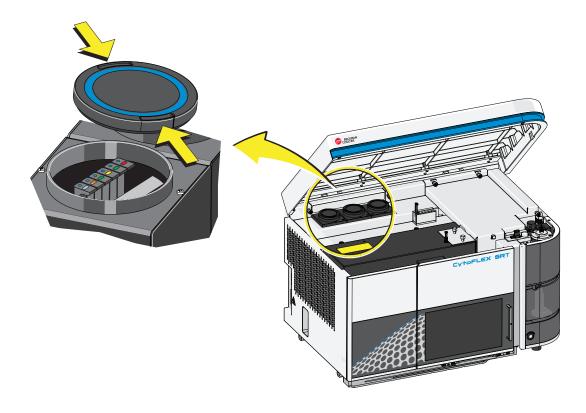
Shut down the system. Refer to System Shutdown in CHAPTER 8, Shutting Down the System.

- **2** Confirm the laser corresponds to the channel in which the optical filter is to be replaced.
- **3** Open the top cover of the instrument.



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4 Press the spring piece of the WDM cap corresponding to the laser, and open the WDM cap.



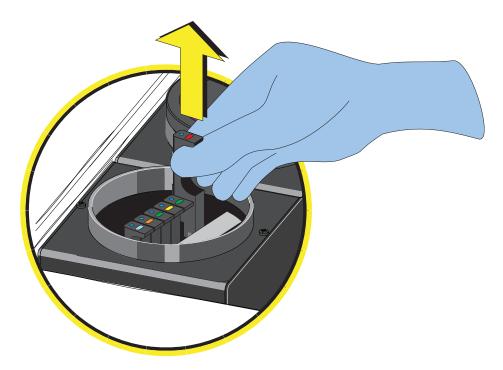
CAUTION

Risk of damage to the optical filter. Do not touch the optical filter glass piece. Touching the optical filter glass piece can obscure and/or scratch the optical filter glass piece.

CAUTION

Risk of damage to the optical filter. Pull the filter straight up when removing it from the WDM. Removing the filter at an angle could chip the edge of the filter glass.

5 Use vertical force to remove the optical filter to be replaced, and note the color identification and wavelength identification on the optical filter bracket.



CAUTION

Risk of damage to the optical filter. Push the filter Straight down when inserting it into the WDM. Inserting the filter at an angle could chip the edge of the filter glass.

6 Insert the optical filter to be installed vertically into the corresponding position, taking care to align the wavelength identification with the left, and that the bracket is inserted into the bottom.

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- **7** Replace the WDM cap and close the instrument top cover.
- 8 Select **Initialize**.

 Or restart the system.
- 9 Select **Detector Configuration** in the Cytometer menu and create a new instrument configuration based on the settings of the new optical filter. Refer to Verifying, Selecting, Editing, and Creating Detector Configuration in CHAPTER 5, Sorting. Set this new configuration as the current configuration.

Changing the Stream Mode





Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.



Risk of biohazardous contamination. The waste stream might contaminate the sort chamber If the waste catcher is not installed in the proper position. Clean up spills immediately. Use barrier protection including protective eyewear, gloves, and suitable laboratory attire when handling the waste catcher or sort chamber because it might contain residual biological material.

Select **Stream Mode Switch** in the Sorting Menu to switch between the Default mode and the Straight Down mode. The Default mode is recommended under most circumstances. However, use the Straight Down mode for better viability in plate sorting.

In the Default mode, the center stream is the waste stream which is collected by the waste catcher and the side stream (L2/L1/R1/R2) is the sort stream and deflected to the collection tubes. In the Straight Down mode, the core stream is the sort stream and the side stream L1 (waste stream) is deflected to the waste catcher.

NOTE The 96-well deep well plate and 384-well plate support only the Straight Down mode.

IMPORTANT Stream Mode Switch is only available when the instrument is in the standby or idle state.

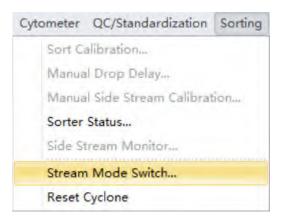
1 Select Standby.

Or

Shut down the system. Refer to Running Shutdown Program in CHAPTER 8, Shutting Down the System.

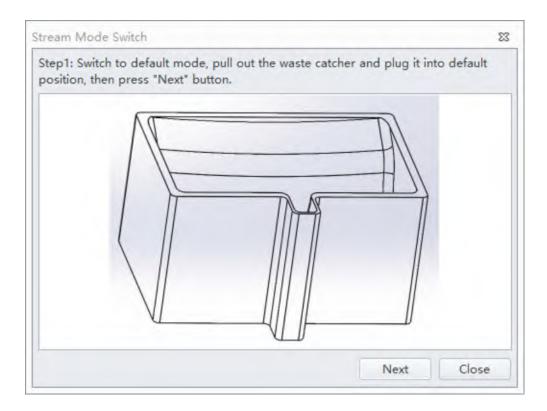
NOTE Skip this step if the instrument is in the Standby state.

2 Select **Stream Mode Switch** in the Sorting menu.



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The Stream Mode Switch window displays.



3 Open the sort chamber sliding door and the sort protection door to access the waste catcher. Refer to Figure 1.21.

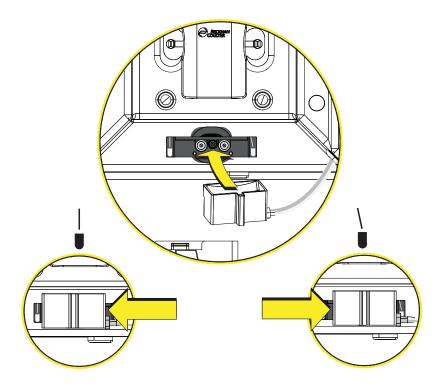
/ WARNING

Risk of biohazardous contamination. The waste catcher could contain residual biological material and must be handled with care. Use barrier protection, including protective eye wear, gloves, and suitable laboratory attire.

Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.

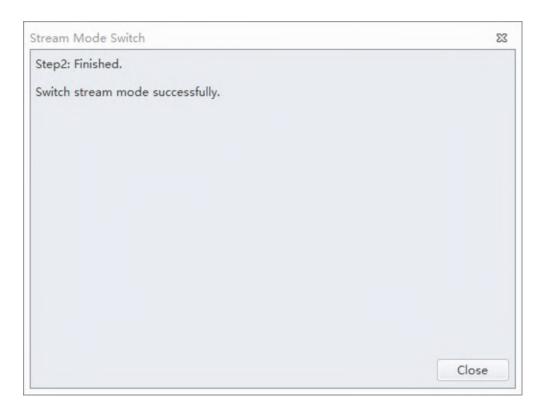
IMPORTANT Ensure the position of the waste catcher matches the Stream Mode. The icon indicates the position for the Straight Down mode and the icon indicates the position for the Default mode.

4 Unplug the waste catcher and plug the waste catcher into the proper position depending on the stream mode selected.



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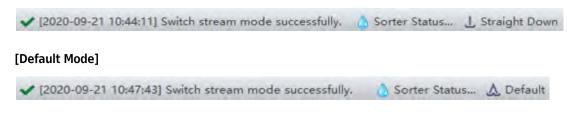
5 Select **Next**. The message *Switch stream mode successfully* displays.



6 Select Close.

The new stream mode displays in the stream mode status bar indicating the stream mode has been correctly switched.

[Straight Down Mode]



Optional: Calibrate the collection device. Refer to Calibrating the Sort Collection Device in CHAPTER 5, Sorting.

Calibrating the Sample Line Bubble Detector

Calibrate the sample line bubble detector:

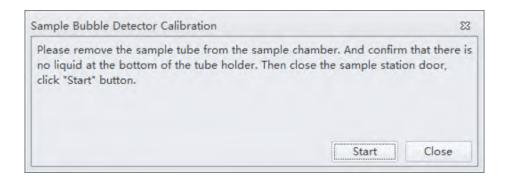
- After replacing the sample line
- After replacing the sample line bubble detector
- Every four months to remove the accumulated drift (recommended)

The system allows you to disable the bubble detector. Refer to Software Settings.

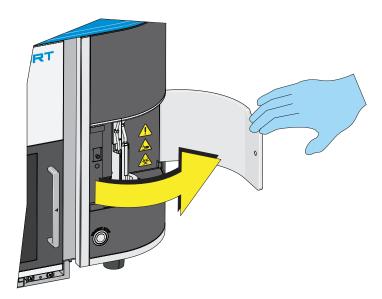
1 Select **Initialize** to put the instrument in the Ready state.

NOTE Skip this step if the instrument is already in the Ready state.

2 Select **Bubble Detector Calibration** from the Advanced menu. The following window displays.

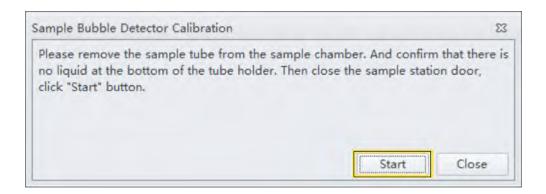


3 Open the sample station door.

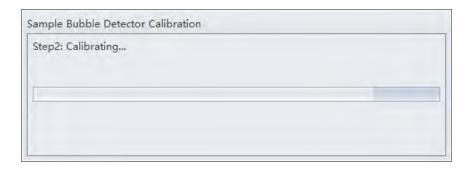


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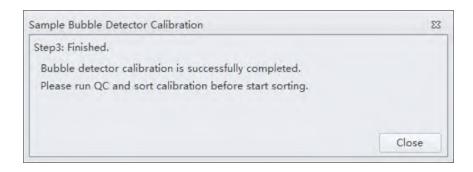
- **4** Remove the sample tube from the sample station.
- 5 Select Start.



The system starts the calibration.



Wait until the system finishes the calibration.



NOTE The bubble detector calibration might introduce bubbles into the system. Proceed removing the bubbles if you want to run sorting. For instructions on removing the bubbles, refer to Removing Trapped Air Bubbles.

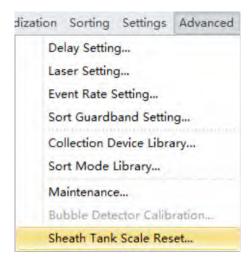
6 Select **Close**. The completion message appears on the instrument status bar.

✓ [2020-09-21 10:53:32] Bubble detector calibration is successfully completed.

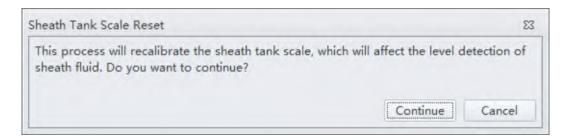
Resetting the Sheath Tank Scale

Reset the sheath tank scale when the sheath status cannot correctly reflect the weight of the sheath in the sheath tank.

- 1 Run System Shutdown program. Refer to Running Shutdown Program in CHAPTER 8, Shutting Down the System.
- 2 Select Sheath Tank Scale Reset from the Advanced menu.

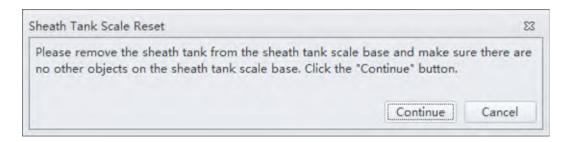


The following window displays.

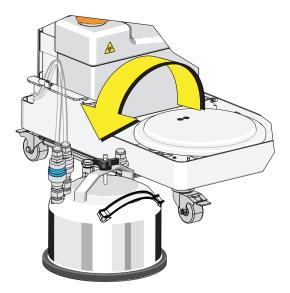


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3 Select **Continue**. The following window appears.



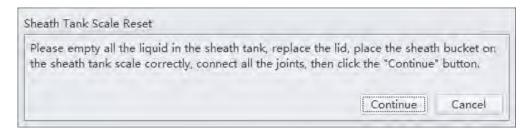
4 Remove the sheath tank from the Fluidics cart and ensure that the sheath tank scale is free of any objects.



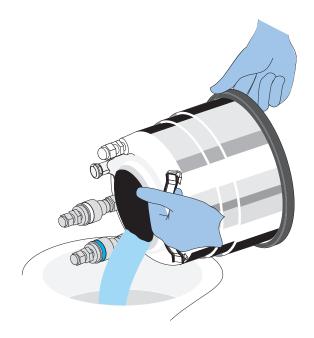
C37808AA

5 Select **Continue**.



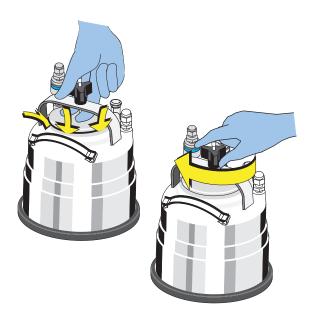


6 Empty the residual sheath fluid from the sheath tank.

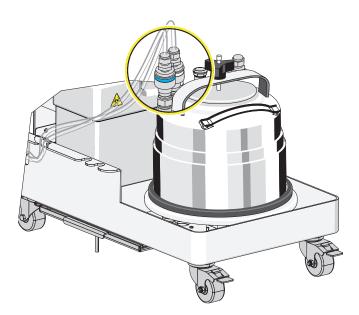


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7 Place the lid back on the sheath tank and tighten it.



8 Put the empty sheath tank back into the Fluidics Cart and plug into the quick connectors.

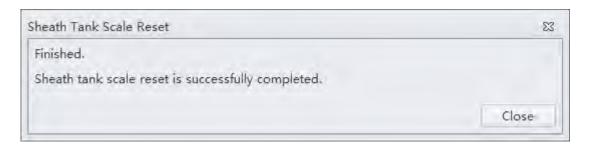


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9 Select **Continue**. The system starts resetting the sheath tank scale.

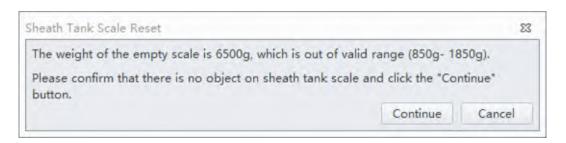


If the detected weight of sheath tank scale is within the valid range (850g - 1850g), the sheath tank scale reset succeeds. Proceed to Step 10.



Or

If the detected weight of sheath tank scale is out of the valid range, the sheath tank scale reset fails.



Repeat Steps 4 - 9.

10 Select Close.

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Approved Cleaners and Disinfectants

Overview

The following list of cleaners and disinfectants can be used on the instrument. If products not specified on this list are used, it may cause damage to the system and void the warranty. If you have any questions or concerns regarding chemical usage on the instrument, contact us.

Other Cleansers may be allowed or suggested in the manual for the optional Biosafety Cabinet. Any cleaning fluid that is called out in the Biosafety Cabinet manual or any other accessories that is not outlined here should not be used on the instrument as it could cause damage.

Cleaners



Risk of damage to the optical surfaces. DO NOT use acetone on the instrument's optical surfaces. The use of acetone could cause damage to optical surfaces. It is recommended to use anhydrous alcohol to wipe the optical filter or the optical protective glasses.

- 70% ethanol in deionized water
- High-quality, fragrance-free, gel-free bleach solution with a maximum concentration of 200 ppm active chlorine
- Deionized water (DI)

Disinfectants for Use in the Sample Line

• 70% ethanol in deionized water (Any disinfectant used on the sample probe must be rinsed with an equal amount of deionized water.)



Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eye wear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

• Bleach solution with a maximum concentration of 200 ppm active chlorine (100 mL household bleach + 1150mL water, 1:11.5 dilution). Use only high-quality, fragrance-free, gel-free bleach. Ten minutes of contact time is needed for disinfection.

Disinfectants for Use in the Sheath Line



Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eye wear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

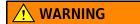
- Bleach solution containing 200 ppm active chlorine (11.5 mL household bleach + 2875 mL water, 1:250 dilution). Use only high-quality, fragrance-free, gel-free bleach (5 to 6% solution of sodium hypochlorite - available chlorine). Ten minutes of contact time is needed for disinfection.
- For yearly decontamination use a bleach solution containing 2000 ppm active chlorine (115 mL household bleach 2875 mL water, 1:25 dilution). Use only high-quality, fragrance-free, gel-free bleach (5 to 6% solution of sodium hypochlorite available chlorine).
- Ethanol, 70% (optional)
- Any disinfectant used in the sheath lines must be rinsed with deionized water for a minimum of 90 minutes.

Disinfectants for Use in the Waste Container





Use universal precautions when working with pathogenic materials. Means must be available to decontaminate the instrument and to dispose of biohazardous waste.



Risk of biohazardous contamination if you have skin contact with the waste container. The waste container could contain residual biological material and must be handled with care.

- Wear protective eye wear, gloves and suitable laboratory attire.
- Clean up spills immediately.
- Dispose of the waste container in accordance with your local regulations and acceptable laboratory procedures.

The following disinfectant types may be used in the waste container. It is pertinent that the appropriate type and quantity of disinfectant is placed in the waste container to ensure effective inactivation of the biological material in use when the tank is full. Always check the compatibility of combined products before use.

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WARNING

Risk of chemical injury from bleach. To avoid contact with the bleach, use barrier protection, including protective eye wear, gloves, and suitable laboratory attire. Refer to the Safety Data Sheet for details about chemical exposure before using the chemical.

• 10% Sodium hypochlorite or bleach. Use only high-quality, fragrance-free, gel-free bleach.

IMPORTANT The waste container might get deformed if autoclave. However, one-time autoclave is necessary before you dispose of the waste container. Use the recommended settings for the autoclave:

• Autoclave temperature: 115 °C;

• Pressure: 15 PSI;

• Duration: 30 minutes.

Sheath Tank

Keep in mind that over time bleach will cause materials to corrode. If you clean a tank with bleach solution, remove the bleach and rinse the tank. For instructions on cleaning the sheath tank, refer to Cleaning the Sheath Tank in CHAPTER 10, Cleaning Procedures.

Deflection Plate Cleaning Materials

Clean the Deflection Plates with 70% ethanol or deionized water.

Approved Cleaners and Disinfectants

Overview

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APPENDIX B Consumables

Consumables

Table B.1 Sheath

Product Part No.	
CytoFLEX IsoFlow Sheath Fluid 10 L	8546859
ISOTON II Diluent, 20 L	8546719

Table B.2 Beads

Product Part No.	
CytoFLEX Daily QC Fluorospheres	B53230
Flow Check Fluorospheres (for the manual drop delay calibration)	6605359

NOTE Review the product insert information for any sheath fluid used with the instrument to evaluate preservatives or incompatibilities with sample buffers.

Table B.3 Cleaning Agent

Product	Part No.
FlowClean	A70449
Contrad 70	81911
Deionized water	N/A
Bleach solution containing 200 ppm active chlorine (100 mL household bleach + 1150mL water, 1:11.5 dilution)	N/A
70% Ethanol	N/A

Table B.4 Shutdown Fluid

Product	Part No.
CytoFLEX SRT Shutdown fluid	C52574

Table B.5 Maintenance

Product	Frequency	Part No.
Bleach solution containing 200 ppm active chlorine (100 mL household bleach + 1150mL water, 1:11.5 dilution)	As needed	N/A
Microfiber swabs	As needed	N/A

Table B.5 Maintenance (Continued)

Product	Frequency	Part No.
HEPA waste air filter	1 month or sooner ^a	C64210
0.2 μm Capsule filter (for the sheath fluid)	6 months	C64209 ^b
0.2 μm Capsule filter (for the Shutdown Fluid)	12 months	
0.2 μm Capsule filter (for the aseptic cleaning fluid)	12 months	
50 μm sheath de-bubble filter	12 months	C64211
Sample line	As needed	C64203
Sample probe	As needed	C64204
CytoFLEX SRT Nozzle Module ^c	As needed	C58834
CytoFLEX SRT Nozzle (100 μm)	As needed	C68147
CytoFLEX SRT O-ring	1 month or sooner	C64205

a. Replace the waste air filter with a new one every time when you perform the Aseptic Cleaning program, or the Long Term Shutdown program.

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b. Do not mix use the filters for different fluids. Put the correct label on the corresponding filter to aovid mistake.

c. Refer to Figure 1.25, Nozzle Module.

Biosafety Cabinet Accessory

Biosafety Cabinet

A BSL-2, Type A2, biological safety cabinet is available as an add-on accessory for the CytoFLEX SRT system. This system meets NSF-49 specifications for this type of Biosafety Cabinet. Refer to Figure C.1. Your Laboratory Safety Officers are responsible for determining if this accessory is required for the type of cell analysis and sorting that is performed on the installed instrument. If a Biosafety Cabinet is part of an installed system, before performing any work, all operators must:

- Be certified to use a Biosafety Cabinet by your laboratory safety officer.
- Have read and fully understand this chapter on how the Biosafety Cabinet interacts with the instrument.

A manual with specifications for the Biosafety Cabinet is available directly from the manufacturer. If a copy of the manual for the Biosafety Cabinet is needed, contact us or the Biosafety Cabinet manufacturer to arrange for delivery. It is assumed that the operator is familiar with the vernacular used in describing the Biosafety Cabinet and has previously read the manufacturer's documentation.

When using the instrument (with or without a biosafety cabinet), safety of the operator, field service personnel, bystanders, and valuable samples is paramount to Beckman Coulter. The proper operation of the Biosafety Cabinet requires appropriate training, an alert operator and adherence to protocols.

In addition to training and following all safety and maintenance actions indicated in the manufacturer's manual, the following information should be reviewed by all operators.

Figure C.1 Instrument Inside Biosafety Cabinet

- 1. View screen
- 2. Airfoil

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! CAUTION

To minimize air flow disruption in order to maintain NSF-49 containment:

- All covers on the instrument must be in the fully closed position during operation.
- Ensure the airfoil is installed on the top of the CytoFLEX SRT instrument.
- Open the sort chamber door or other access panels slowly to allow any aerosols present to be captured by the Biosafety Cabinet.
- Do not use auxiliary devices within the Biosafety Cabinet such as stirrers, hot
 plates, HEPA filtration units, chillers, etc. The electronics, fans, shape and size
 of these objects may disrupt air flow within the Biosafety Cabinet.
- Do not place objects in the area marked as a "Non-Work Zone." This includes all tools, wrenches, test tubes and test tube holders, gloves, boxes, paperwork, notebooks or any other items.
- Do not block the exhaust outlet on the top of the Biosafety Cabinet. Do not block the induction zone of the Biosafety Cabinet (the front opening and the lower grill).
- The view screen operating height is indicated on the edge of the Biosafety Cabinet with arrows. The bottom of the view screen must be aligned with the arrows for proper air flow.

Biosafety Cabinet Installation

Beckman Coulter Representatives help arrange for the purchase, and installation of your Biosafety Cabinet. The Biosafety Cabinet can be applied to the existing system or can be ordered with the system when it is first purchased.

The Biosafety Cabinet will be installed on site by a Beckman Coulter Representative. After installation, the Biosafety Cabinet will be tested by a local certified technician and performance documentation will be provided to the lab where it is installed. Certification of Biosafety Cabinet should be performed by a third party.

There are many environmental factors to consider when a Biosafety Cabinet is installed. Items to review include access to the final location for the instrument, including how it will move all the way from the loading dock up to and through the last door, electrical power requirements, altitude and relative humidity. In order for the instrument to perform properly, it is important that the stability and range of the ambient temperature is within the instrument's 2 °C per hour per specification. The size of the room in which the system will operate is an important consideration as too small of a volume will heat up quickly due to heat generated by the equipment, and is difficult to cool. Contact us for more detailed information.

Type A2 Biosafety Cabinets are designed to exhaust into a populated room. An optional method of attaching to the facility exhaust is available from the manufacturer.

The Biosafety Cabinet has been designed with brackets that can be utilized as seismic restraint points should they be required in your location.

№ WARNING

The instrument/Biosafety Cabinet System has a large mass and a high center of gravity. Serious injury or death may occur due to the unit tipping over. Take special precautions in situations where tipping over may be of concern, such as when the system is moved.



There is a risk of personal injury from lifting the Biosafety Cabinet. The Biosafety Cabinet weighs 302 Kg (665 lbs) and requires five people to lift and move it safely.

Decontamination of the Biosafety Cabinet

You may need to occasionally decontaminate the Biosafety Cabinet.

Beckman Coulter does not provide service for the Biosafety Cabinet. The CytoFLEX SRT Sorter is a high performance instrument with sensitive electronic, optical and mechanical components. Contact your local service provider or the Biosafety Cabinet manufacturer for decontamination requirements prior to Biosafety Cabinet service.

There are some conditions under which your Biosafety Cabinet must be decontaminated before work is performed by Beckman Coulter. Proof of this decontamination must be presented to Beckman Coulter before any work will commence. Instances where the Biosafety Cabinet must first be decontaminated:

- Any time when the Biosafety Cabinet and instrument are to be dismantled (moving to another location, decommissioning, etc.)
- Any time service personnel determine that troubleshooting or component removal/replacement will require bodily entry inside the Biosafety Cabinet area.

Biosafety Cabinet Maintenance and Service

The Biosafety Cabinet has been designed to minimize the need for service or periodic maintenance beyond the need for daily cleaning by the user. In the unlikely event that the Biosafety Cabinet has a component failure, all components can be serviced on site. This must be performed by a qualified and trained Biosafety Cabinet personnel.

Operating the Biosafety Cabinet and the Instrument

Follow the good practices:

- Never work inside the cabinet when an alarm condition exists.
- Never use the Biosafety Cabinet to store supplies or laboratory equipment.
- Personnel should avoid walking by the front of the Biosafety Cabinet to avoid air disturbances.
- Reduce unnecessary movements in and out of the work area.

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- Leave the Biosafety Cabinet running continuously to ensure cleanliness.
- All spills should be dealt with immediately. After cleaning and disinfection, all surfaces should be rinsed with sterile water and wiped completely dry.



Risk of system halting or instrument damage due to overheating inside the Biosafety Cabinet. Turn on the Biosafety Cabinet blower while running the CytoFLEX SRT instrument inside the Biosafety Cabinet.

The Biosafety Cabinet must be on in order to assure proper air flow for both pathogen containment and cooling for the instrument.

The Biosafety Cabinet is capable of running continuously. This is preferable in that it minimizes system temperature fluctuations.



Note that the use of an external Aerosol Evacuation System (AES) outlined in Chapter 1 is redundant and potentially disruptive to NSF-49 pathogen containment when the instrument is coupled to the Biosafety Cabinet. Do not use the external Aerosol Evacuation System inside the Biosafety Cabinet. To mitigate this, the Biosafety Cabinet provides an Aerosol Evacuation System connection in the back left portion of the cabinet. This should be connected to the port on the lower right corner of the CytoFLEX SRT instrument.

If the Biosafety Cabinet is left running for an extended period of time and the instrument is not used, salt crystals may form in the nozzle causing stream deflection or blockage. It is a good practice to ensure that the nozzle is clean and clear after a prolonged period without usage.

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When the Biosafety Cabinet is certified for use on-site, the certifier will program the pressure monitor with the proper air pressure set points. Do not modify or otherwise tamper with the pressure monitor as doing so could allow operational situations where the Biosafety Cabinet does not meet NSF-49 containment criteria.

! WARNING

Dampers that control the air flow balance of the Biosafety Cabinet are to be set to the correct position by a certified installer. Do not tamper with the positions once they are set to ensure the Biosafety Cabinet complies with NSF-49 containment criteria.

• WARNING

Use proper laboratory technique and do not inadvertently transfer contaminates in and out of the Biosafety Cabinet by touching the sample, then the View screen of Biosafety Cabinet, then the keyboard, etc.

Biosafety Cabinet Specification

For additional specifications and details, see the manufacturer's product manual.

Table C.1 Biosafety Cabinet Specifications

Specification (Biosafety Cabinet Only)	Requirements
Model	BEC404XD
Service Access	Minimum of 15 cm (6 in.) to the ceiling, no access to the back and sides of the instrument is needed on a daily basis. To decontaminate, there must be room for a person to move around the entire perimeter of the Biosafety Cabinet. The instrument and Biosafety Cabinet can be moved away from a wall(s) for this purpose.
Instrument Dimensions	Footprint: 136.5 cm x 77.9 cm
	Weight: 302 Kg (665 lbs.)
	Minimum height: 2188 cm (86 in.)
Humidity and Temperature Range for Instrument Storage and Operation	The Biosafety Cabinet has temperature and humidity ranges that support the instrument.
Maximum Altitude	2000 m (6561 ft)
Electrical Power	Option 1 - USA - 115 Vac, 60 Hz at 20A, dedicated
Requirements	Option 2 - Europe - 220 Vac, 50 Hz at 15A, dedicated
	Option 3 - Japan - 100 Vac, 50/60 Hz at 20A, dedicated

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Table C.1 Biosafety Cabinet Specifications

Specification (Biosafety Cabinet Only)	Requirements
Category	BSL-2, Type A2
Maximum weight capacity for the work surface	90 Kg (200 lbs)

Biosafety Cabinet Accessory Biosafety Cabinet

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Instrument Installation

Overview



The CytoFLEX SRT instrument is installed by your Beckman Coulter Service Representative. Do not open the box or crate. Wait for a qualified Beckman Coulter Service Representative.

This chapter contains information on:

- Instrument Transportation and Storage
- Installation Environment Validation
- Installing the Instrument and Connection
- Installing the Software
- Upgrading and Reinstalling the CytExpert SRT Software
- Network Configuration

Instrument Transportation and Storage

Attention to the following items is required when transporting or storing the instrument:

- Take caution to protect the instrument from exposure to rain or sunlight. Avoid corrosives of flammable gas.
- Always place the instrument on a flat, stable surface, and take note of the symbol for this side up.
- Temperature range: see Temperature and Humidity.
- To prevent extrusion, the load on top cannot exceed 100 kg.
- CytoFLEX SRT instrument net weight 65 kg, gross weight 108 kg; transport the instrument using only appropriate equipment so as to guard against personal injury.

Installation Environment Validation

IMPORTANT This instrument is intended for indoor use only.

Verify whether the installation environment satisfies the following requirements:

Worktable



Risk of instrument damage. Place the instrument on a level surface. Failing to do so places the system is in danger of toppling and can result in damage. Take all necessary precautions throughout the process of storing or transporting the instrument.

- The tabletop must be smooth and level.
- Minimum tabletop load bearing capacity: 100 kg.
- The tabletop must not vibrate or shake. Do not use the table with casters.
- Minimum tabletop dimensions: 180 cm x 85 cm (Fluidics cart on the table); 150 cm x 85 cm (Fluidics cart on the floor)
- Minimum vertical space above tabletop: 100 cm
- Maximum height gap between the tabletop and the fluidics cart: 100 cm
- Position the instrument in such a manner that it will facilitate disconnection of the power cable at the left side of instrument.

Ventilation and Cleaning

IMPORTANT If necessary, use ventilation equipment, but airflow must not be allowed to blow directly on the system, as it can affect the reliability of the data.

- Ensure that the working environment is well ventilated for proper heat dissipation.
- Maintain a clearance of at least 10 cm from the back of the instrument for heat dissipation.
- Keep the environment as dust free as possible.
- Avoid direct exposure to sunlight.
- Avoid placing near heat sources or exposing to drips.
- Avoid corrosives or flammable gases.
- Avoid placing near the source of strong electromagnetic radiation.
- Altitude: 0-2000 m

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Power Source

DANGER

Risk of electric shock and/or instrument damage. Ensure that the power source is properly grounded. Improper grounding can cause electric shock and damage the system. Verify that the output voltage of the power outlet conforms to the system requirements and that a 5 A, time delay, T 5 AL 250 VAC fuse is installed. To prevent personal injury, Beckman Coulter recommends using a power source designed to protect against electrical shock.

CAUTION

Possible instrument damage could occur if you use an extension cord or a power strip to connect the Sorter. Always plug the Sorter into a dedicated outlet with an isolated ground.

The power source requirements are as follows:

- This instrument has been tested to and meets all applicable requirements for CE Marking.
- This instrument complies with the emission and immunity requirements described in IEC 61326-1.
- This equipment has been designated and tested to CISPR 11 Class A. In a domestic environment it might cause radio interference, in which case, you need to take measures to mitigate the interference.
- It is advised that the electromagnetic environment should be evaluated prior to operation of the device.
- Do not use this device in close proximity to sources of strong electromagnetic radiation (unshielded intentional RF sources), as these might interfere with the proper operation.
- 100-240 volts, 50/60 Hz, 3-wire power cable, well grounded.
- Amperage not less than 10 A.
- The system requires a well-grounded power outlet (200 VA normal) to provide the necessary power.
- Distance from system to socket less than 1.5 m.

Temperature and Humidity

<u>^</u>CAUTION

Risk of instrument damage and/or erroneous results. To ensure reliability, the system must be operated in the specified environment, within the required temperature and humidity ranges. If the ambient temperature or humidity level falls outside the ranges mentioned above, use appropriate air conditioning.

• [Inside a lab]: Ambient temperature (operation): 15-27°C with fluctuations of no more than ±2 °C per hour.

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- **[Inside Biosafety Cabinet]:** Ambient temperature (operation): 15-23°C with fluctuations of no more than ±2 °C per hour.
- Ambient temperature (storage): -10 °C to 55 °C
- Relative humidity: 20% RH-80% RH (non-condensing).

Waste Disposal







Risk of biohazardous contamination if you have skin contact with the waste container, its contents, and its associated tubing. The waste container and its associated tubing might contain residual biological material and must be handled with care. Clean up spills immediately. Dispose of the contents of the waste container in accordance with your local regulations and acceptable laboratory procedures.

The waste line from the Sorter is connected to a waste container. Dispose of the system's waste in accordance with your local regulations and acceptable laboratory procedures.

The waste line supplied with the instrument can be connected to an open drain. If you use an open drain, mechanically secure the waste tube into the drain so the tube cannot accidentally come out of the drain. This prevents spillage.

Installing the Instrument and Connection

The CytoFLEX SRT must be installed by a trained Beckman Coulter service engineer. For connecting the instrument, refer to System Connections in CHAPTER 1, System Overview

Installing the Software

The installation process workflow is as follows:



The CytExpert software can be installed on any computer that meets the minimum specifications (see Instrument Specifications in CHAPTER 1, System Overview) for analysis-only use.

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Required Materials

The following materials are required to install the CytExpert software:

- CytoFLEX SRT Sorter.
- Workstation.
- CytExpert SRT software installation USB.

Installing the CytExpert SRT Software

IMPORTANT Follow this procedure when installing the CytExpert software for the first time.

- 1 Ensure the workstation and the monitor are powered on.
- Insert the software USB into the computer.

NOTE If the AutoPlay window appears, select Open folder to view files.

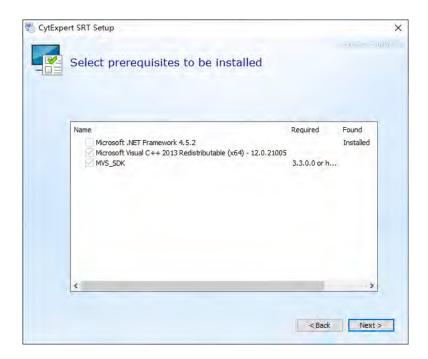


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3 Select CytExpert SRT_x.x Setup.exe. The Welcome to the Prerequisites Setup Wizard window appears.



- 4 Select Next.
- **5** Select both the program check-boxes in the CytExpert SRT Setup Prerequisites window.



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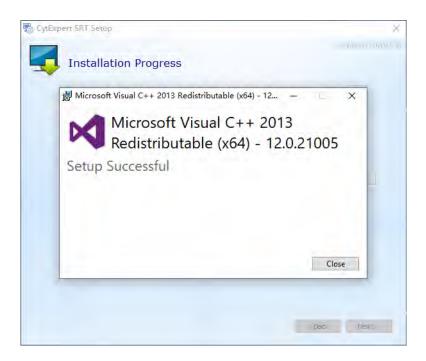
6 Select **Finish**. The Microsoft Visual C++ 2013 Redistributable Setup window appears.



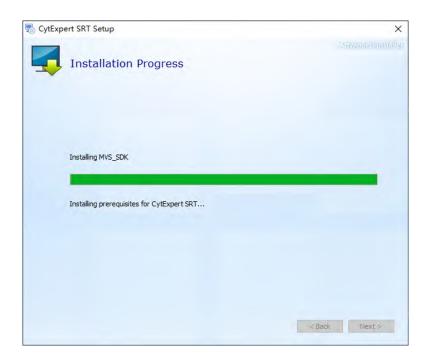
- **7** Read the Microsoft software license terms and conditions.
- **8** Select the *I* agree to the license terms and conditions check-box.

NOTE The check-box is not selectable until you scroll all the way to the end of the agreement.

9 Select **Install**. The Setup Successful window appears when installation has finished.



10 Select Close. The Installation Progress window appears.

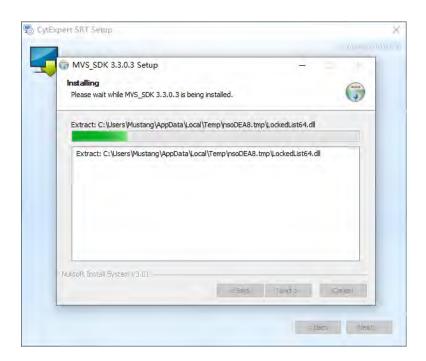


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11 Select Next. The Welcome to MVS_SDK window appears.



12 Select Install.





The Setup Successful window appears when installation has finished.

 $\textbf{13} \ \ \textbf{Select Finish.} \ \textbf{The CytExpert SRT Setup Welcome window appears.}$



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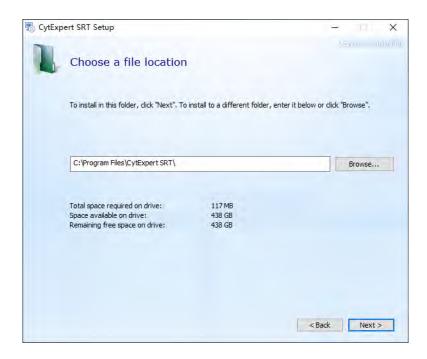
14 Select **Next.** The Read the Beckman Coulter License Terms window appears.



- **15** Read the Beckman Coulter Customer End User License Agreement.
- **16** Select the *I accept the terms of this agreement* check box.

NOTE The check-box is not selectable until you scroll all the way to the end of the agreement.

17 Select Next. The Choose a file location window appears.

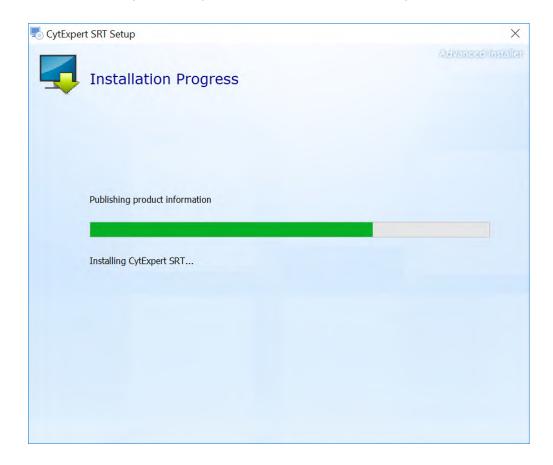


18 Select **Next**. The Begin installation of CytExpert SRT window appears.

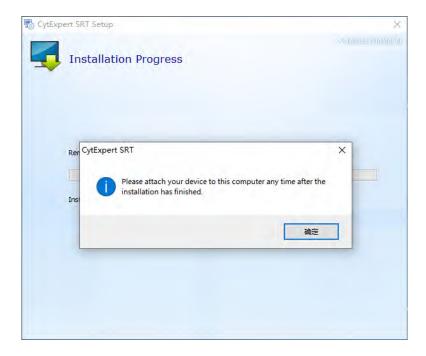


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 $\textbf{19} \ \ \textbf{Select Install} \ \textbf{to begin installing the software.} \ \textbf{The Installation Progress window appears.}$



20 If the following software prompt appears, select **ok**.



NOTE The term "device" in this message refers to the Sorter.

 ${\bf 21} \ \ {\bf Wait\ for\ the\ software\ to\ finish\ installing.}\ {\bf The\ install\ complete\ window\ appears.}$



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22 Select **Close** to finish the CytExpert SRT software installation.

Starting the Software

IMPORTANT The default username is *admin*. The default password is *password*.

- Insert the USB configuration key into the USB port of the computer.
- 2 Start the software. Refer to Logging Into the Software in CHAPTER 3, Daily Startup, for detailed instructions on opening the software and confirming the connection status.

NOTE If the software shows *Connected*, data collection and analysis can be completed.

Upgrading and Reinstalling the CytExpert SRT Software

Use this procedure to:

- Reinstall the same version of software
- Upgrade the software to a higher version than software version 1.0



Risk of data loss. Reinstalling the CytExpert SRT Software could overwrite your database. Ensure you backup your database prior to software re-installation or upgrade.

Uninstalling the Software

- In the start menu, select **Control Panel**.
- 2 Select Programs > Uninstall a program.
- **3** Select the "CytExpert SRT" program, right-click the "CytExpert SRT".

IMPORTANT Do not remove the existing settings, database, Cytometer configuration and temporary files.

4 Select **Uninstall** and follow the software instructions to uninstall.

Upgrading and Reinstalling the CytExpert SRT Software

1 Insert the software USB into the computer.

NOTE If the AutoPlay window appears, select Open folder to view files.



2 Select CytExpert SRT_x.x Setup.exe. The Welcome to the CytExpert SRT Setup Wizard window appears.



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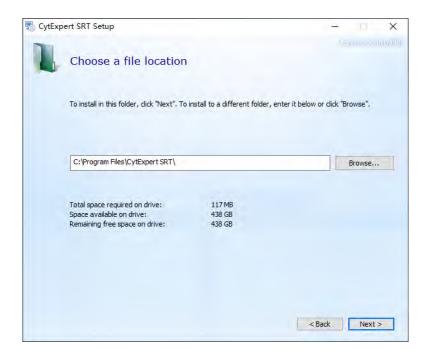
3 Select Next. The Beckman Coulter License Terms window appears.



- 4 Read the Beckman Coulter Customer End User License Agreement.
- **5** Select the I accept the terms of this agreement check-box.

NOTE The check-box is not selectable until you scroll all the way to the end of the agreement.

6 Select **Next**. The Choose a file location window appears.

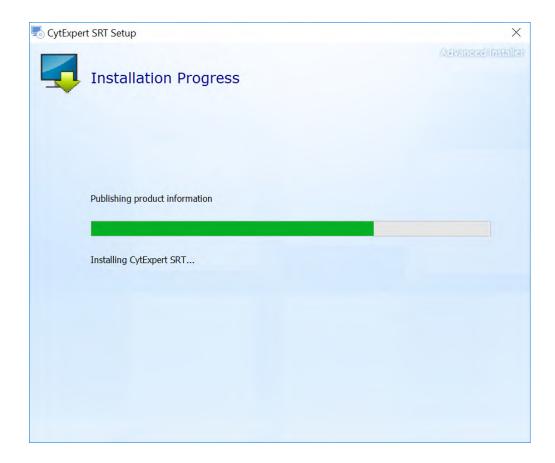


7 Select **Next**. The Begin installation of CytExpert window appears.



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8 Select **Install** to begin installing the software. The Installation Progress window appears.



9 Wait for the software to finish installing. The install complete window appears.



10 Select Close to finish the CytExpert SRT software installation.

Network Configuration

The CytoFLEX SRT workstation should supports dual Ethernet ports. One port is for data communication between the PC and the Sorter (refer to Figure 1.34), and the other one is for internet or local network connectivity.

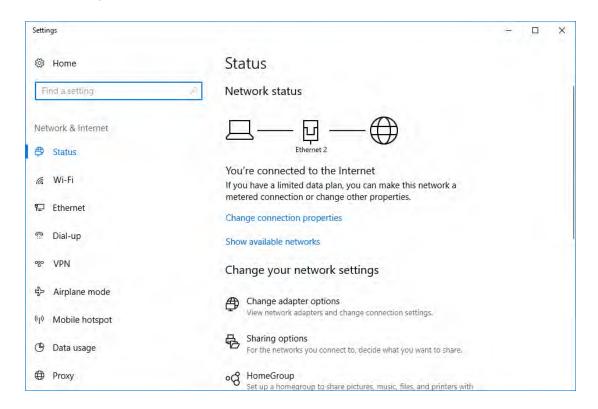
Configuring IP Address

1 Select Network & Internet settings from the Windows menu bar.

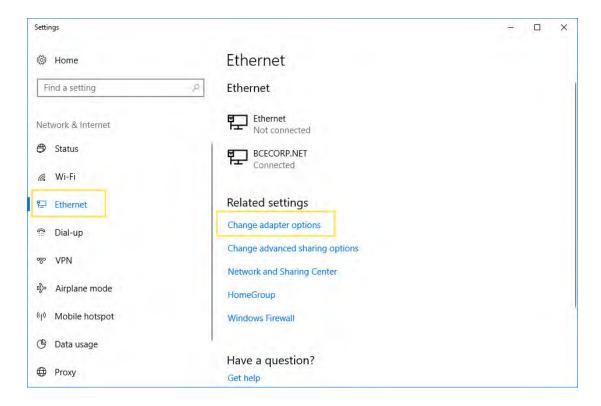


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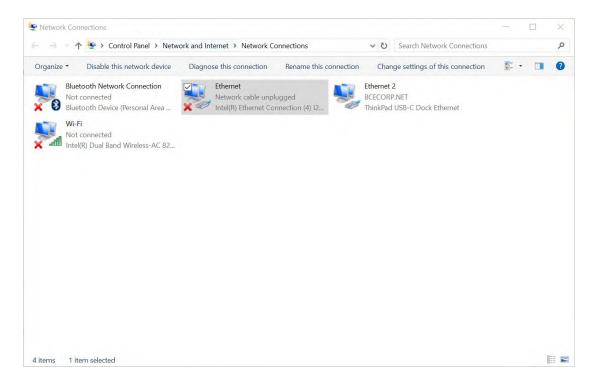
The following window appears.



2 Select Ethernet > Change adapter options.

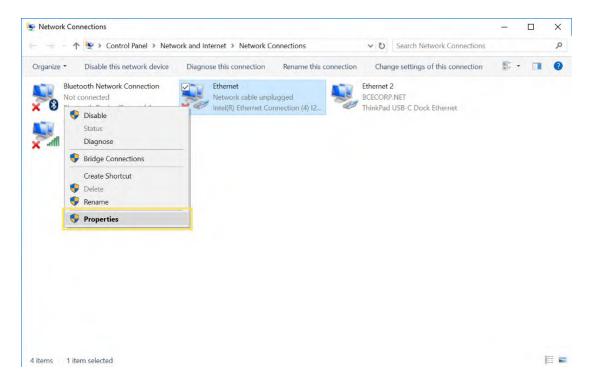


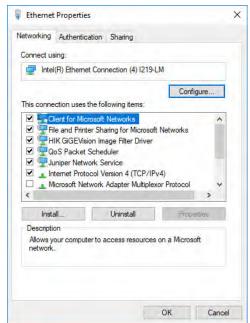
The following window appears.



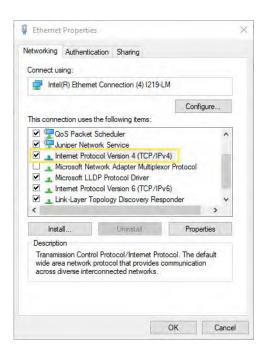
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Right-click **Ethernet** and select **Properties** to access the Ethernet Properties window.





4 Select Internet Protocol Version 4 (TCP/IPv4)

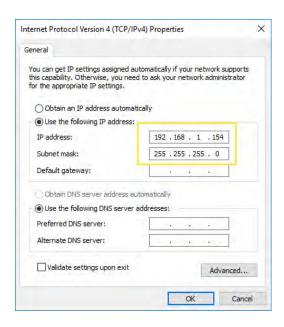




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IMPORTANT Consult your IT professional for the IP configuration.

- The Sorter's default IP address is 192.168.1.155.
- To ensure the communication between the PC and the Sorter, the wired network of the PC should be in the same network segment, for example, 192.168.1.154.
- Do not distribute these two dedicated IP addresses to other network devices. Otherwise, your Sorter might experience the IP conflict error.
- **5** Set the IP address.



6 Select **οκ**.

Instrument InstallationNetwork Configuration

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Good Practices for Cyber Security

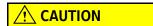
Overview

The following procedures are the only validated and approved recommendations for cyber privacy and security. Contact your IT professional for assistance.

- Changes below require Administrator Level Windows access.
- Before connecting to an external device such as a hard drive, USB, or DVD/CD, verify it does not
 have a virus or malware.

NOTE Beckman Coulter recommends using different anti-virus software to ensure that all viruses or malware can be identified.

- Disable all the unused USB ports on the instrument computer.
- Close all unnecessary applications while operating the CytExpert SRT software.



System integrity could be compromised and operational failures could occur if:

- You introduce software that is not authorized by Beckman Coulter into your computer. Only operate your system's computer with software authorized by Beckman Coulter.
- You apply domain policies which alter the default configuration.
- You alter the system in a manner other than the approved changes outlined below.

This chapter contains information on:

- Drive Encryption
- Protection from Malware Software
- Operating System Updates
- System Hardening

Drive Encryption

Your Windows 10 system is equipped with BitLocker. Use BitLocker disk encryption software to prevent unauthorized access to your hard drive, refer to BitLocker Keys. For instructions on BitLocker Encryption or BitLocker Decryption, see Enabling BitLocker or BitLocker Decryption.

IMPORTANT BitLocker is the only approved encryption method.

BitLocker Keys



Risk of data loss. Store your BitLocker key in a safe place. For instructions on saving your BitLocker key, refer to Backing Up Your Recovery Key. If you lose your BitLocker Key, you will lose access to your entire hard drive including all of your data. Beckman Coulter is not responsible for security keys and will not be able to recover your data off your hard drive. Work with your IT department in creating and storing the keys in a safe place.

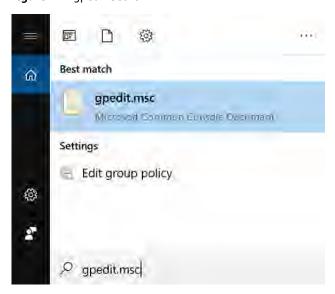
Changing Encryption Strength Level for BitLocker

BitLocker defaults to XTS-AES 128-bit encryption method. To alter the encryption, follow the steps below before enabling BitLocker. Changes to the encryption level will only impact the encryption of new volumes. Work with your IT department to change the Encryption Strength Level.

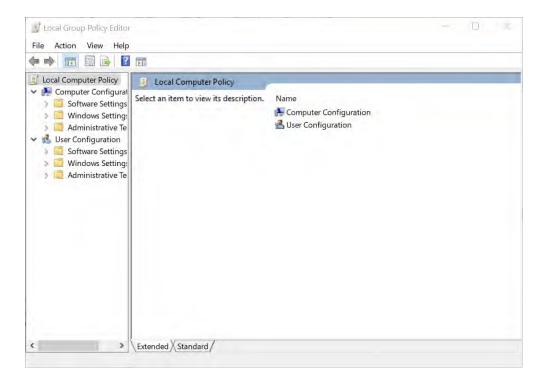
Changing the encryption strength for BitLocker

1 Type **gpedit.msc** from the Windows search bar to locate the gpedit Control Panel, see Figure E.1.

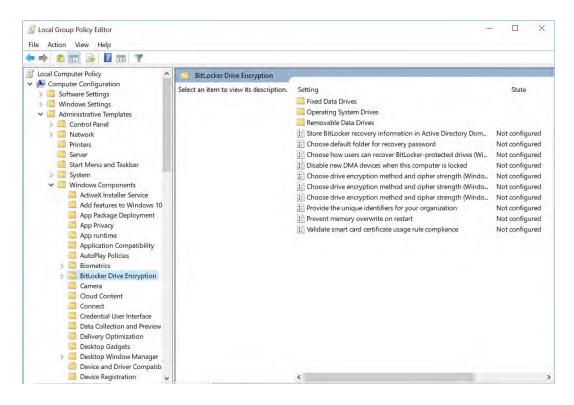
Figure E.1 gpedit Search



2 Click **gpedit.msc.** The Local Group Policy Editor window appears.

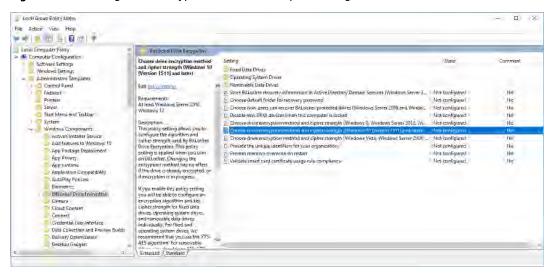


3 Navigate to Computer Configuration > Administrative Templates > Windows Components > BitLocker Drive Encryption.



4 Double-click "Choose drive encryption method and cipher strength (Windows 10.....)". Refer to Figure E.2.

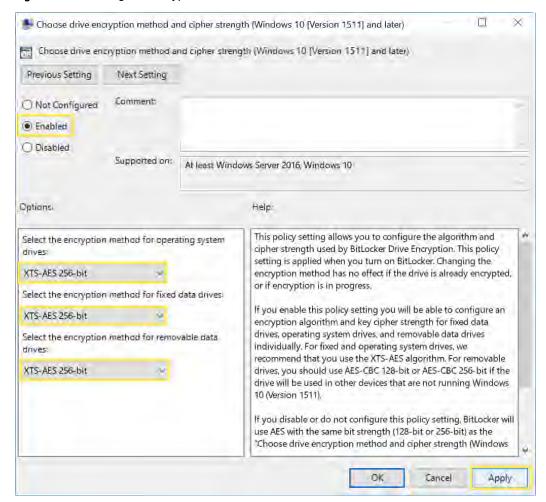
Figure E.2 Choosing Drive Encryption Method and Cipher Strength



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5 Select **Enabled** and use the drop-down arrows to select the encryption method for the operating system drive, fixed data drive, and for the removable data drives, see Figure E.3.

Figure E.3 Choosing the Encryption Level

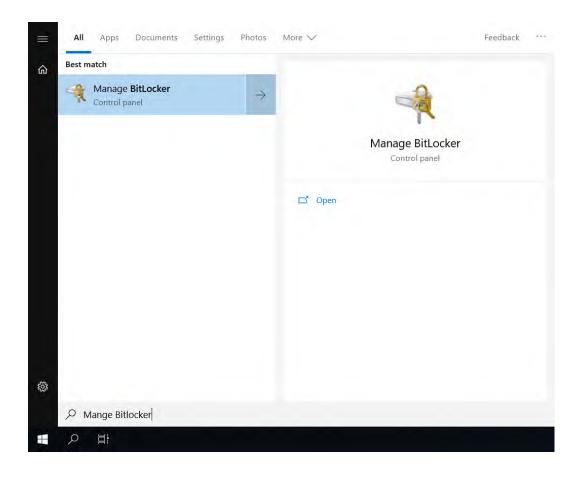


NOTE The default is set to XTS-AES 128-bit.

- 6 Select Apply.
- **7** Select **OK** and close all windows.
- **8** Restart the computer and proceed to Enabling BitLocker.

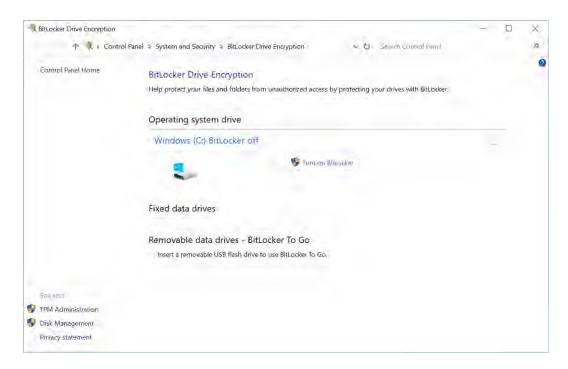
Enabling BitLocker

Type Manage BitLocker from the Windows search bar to locate the Manage BitLocker Control Panel.

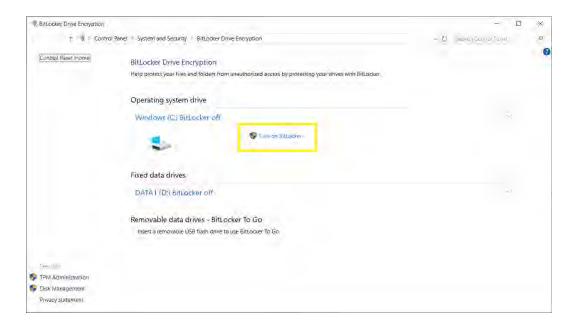


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2 Double-click Manage BitLocker to open the BitLocker Drive Encryption window.

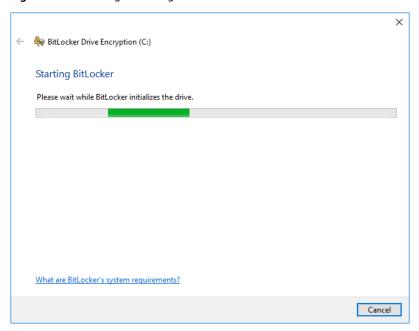


3 Select Turn on BitLocker from the Control Panel screen.

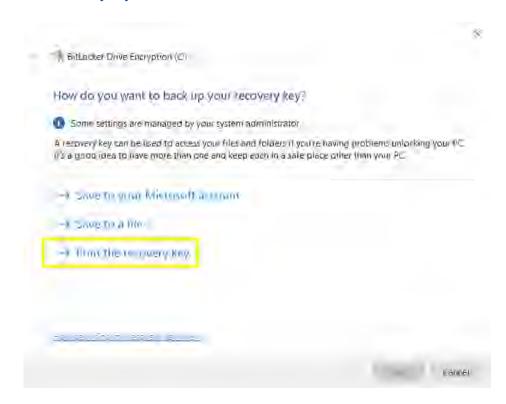


4 BitLocker verifies that your PC meets the requirements. Refer to Figure E.4.

Figure E.4 Checking PC Configurations



5 Select **Print the recovery key** to back up the recovery key. For instructions, refer to Backing Up Your Recovery Key.

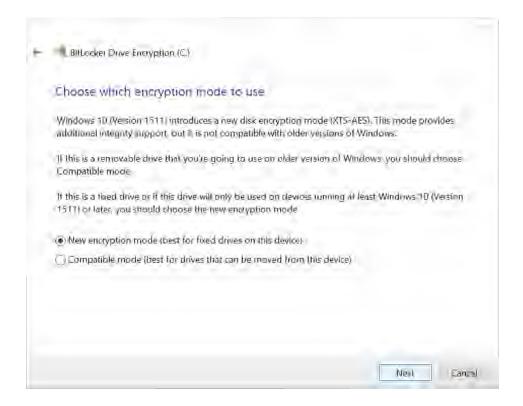


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6 Select "Encrypt used disk space only (faster and best for new PCs and drives)", then select **Next**.

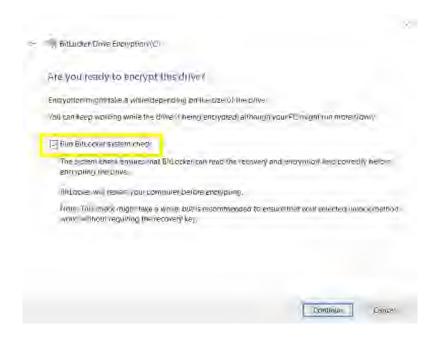


7 Select "New encryption mode (best for fixed drives on this device)", then select **Next**.



IMPORTANT The system check ensures that BitLocker can read the recovery and encryption keys correctly before encrypting the drive. This check might take some time, but it is recommended to ensure that your selected unlock method works without requiring the recovery key.

8 Select "Run BitLocker system check", then select **Start encrypting**.



NOTE BitLocker restarts your computer before encrypting.

9 Select **Restart now** to start the BitLocker Encryption.

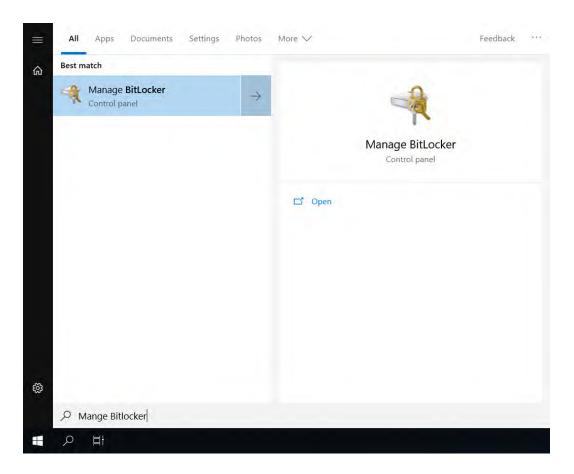


10 Enter your password in the Password screen.

NOTE After logging in you will see a Window that says **Encrypting in Progress**.

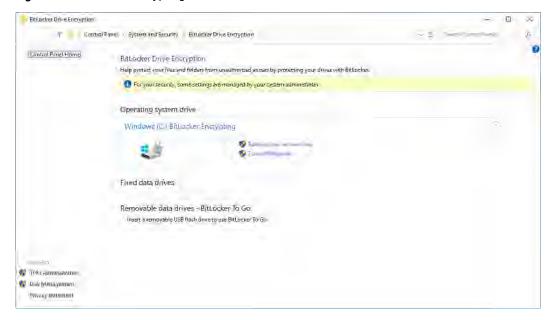
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11 Open the Manage BitLocker Control Panel from the Windows search bar.



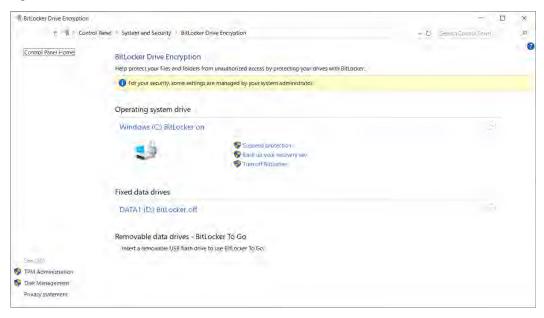
12 Under Operating System Drive, you will see the BitLocker is Encrypting the drive. See Figure E.5.

Figure E.5 BitLocker Encrypting the Drive



13 Once the BitLocker has encrypted the drive, the BitLocker will be on. See Figure E.6.

Figure E.6 BitLocker Successfully On

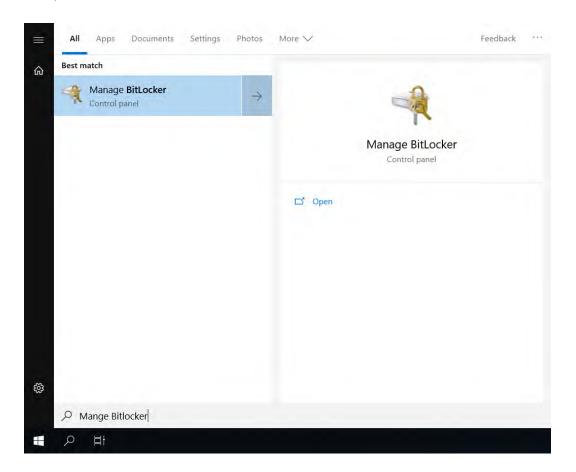


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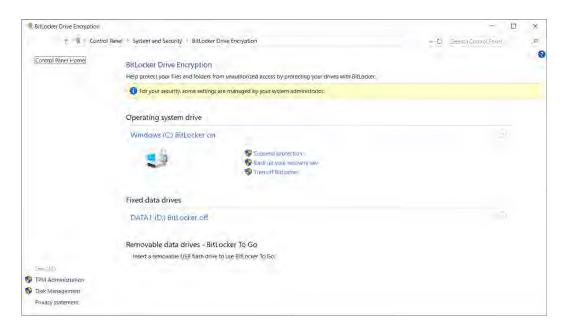
Backing Up Your Recovery Key

IMPORTANT The Back Up Your Recovery Key to your Microsoft Account is not supported at this time.

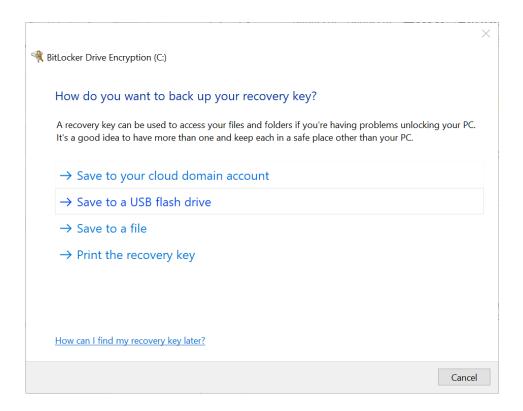
Type Manage BitLocker from the Windows search bar to locate the Manage BitLocker Control Panel, see below.



2 Double-click **Manage BitLocker** to open the BitLocker Drive Encryption window.



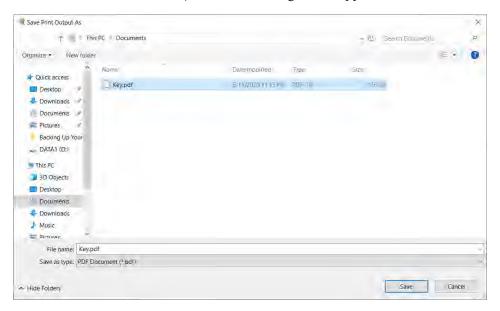
3 Select "Backup your recovery key". The following window appears.

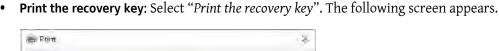


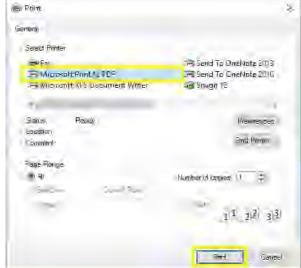
E-14 C37808AA

IMPORTANT The Recovery Key can only be saved to a USB or external drive. You cannot save to a location on your PC.

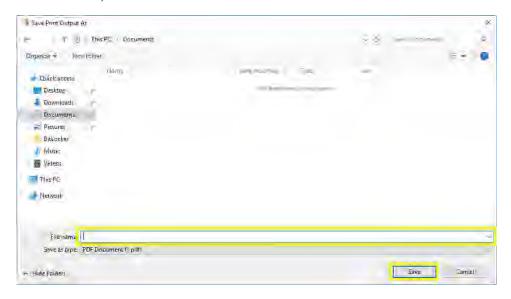
- **4** Select a destination to save the Recovery Key.
 - **Save to a file:** Select "Save to a file". The following screen appears.







1. Select "Microsoft Print to PDF", and then select Print.



2. Select the location that you want the file saved. In the File name, type **BitLocker Key** and in the Save as type, ensure that it is listed as.pdf.

5 Select Save then select Finish.

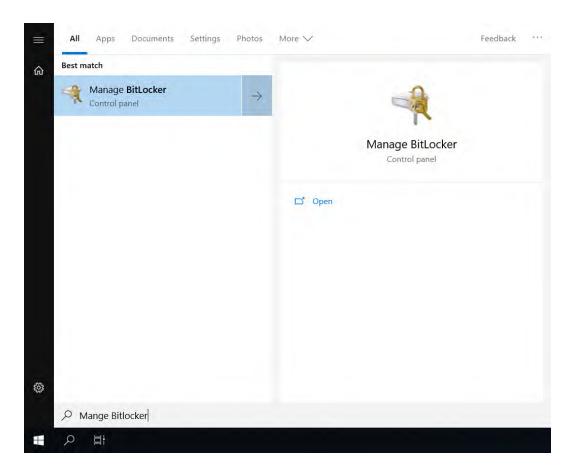
E-16 C37808AA

BitLocker Decryption

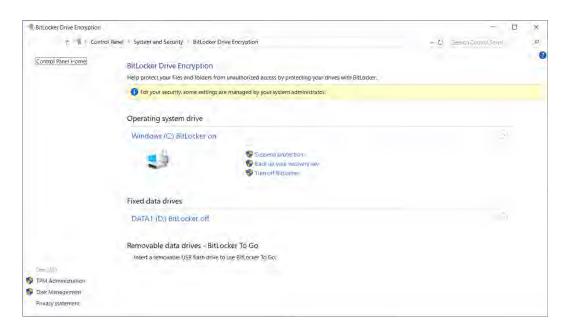
IMPORTANT Turning off the BitLocker feature decrypts all the data on the drive. Decrypting your operating system means that you have removed BitLocker from your system. The BitLocker key will change each time BitLocker is re-enabled. Only the latest BitLocker key will work. Previous BitLocker keys will be invalid and will not unlock the system. Please note this is a time-consuming process. However, you can also suspend BitLocker instead of decrypting the drive, see Suspending BitLocker Drive Encryption.

Turning off BitLocker

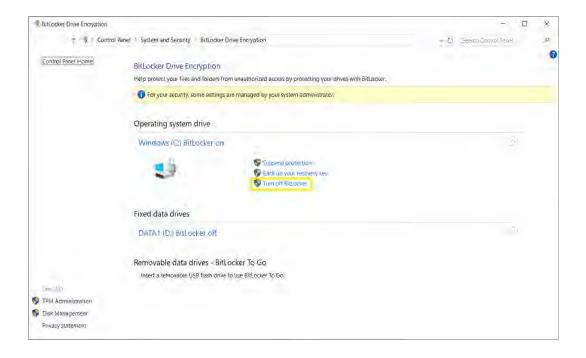
Type Manage BitLocker from the Windows search bar to locate the Manage BitLocker Control Panel.



2 Double-click Manage BitLocker to open the BitLocker Drive Encryption.



3 Select Turn off BitLocker.



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The following message appears.

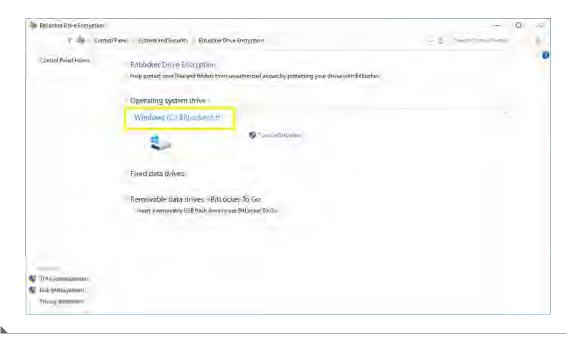


IMPORTANT Drive decryption might take a long time, but you can keep using your PC during the decryption process.

4 Select **Turn Off BitLocker**. The BitLocker Drive Decryption screen displays.



After the decryption has completed, the following screen displays.



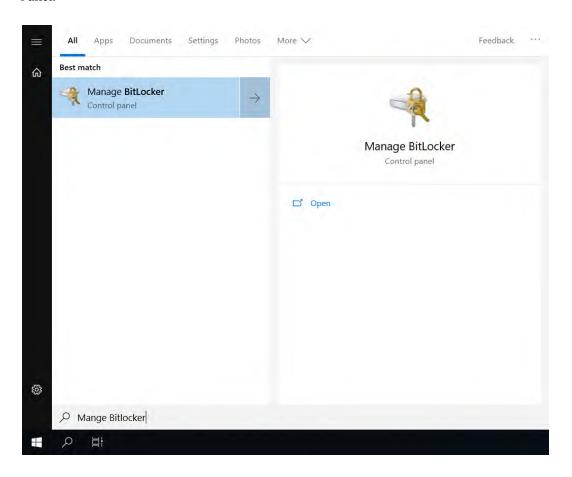
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Suspending BitLocker Drive Encryption

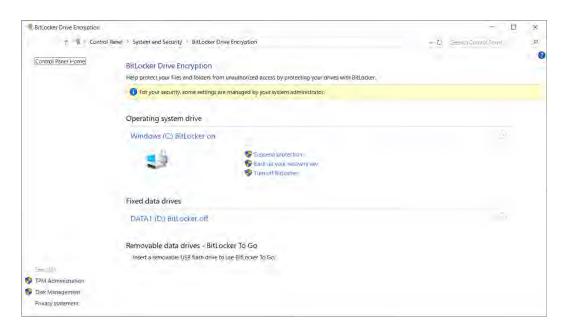
IMPORTANT Suspending BitLocker Drive Encryption is a temporary method for removing BitLocker protection without decrypting the Windows drive. Use Suspend BitLocker if you need to update the BIOS firmware or Windows boot loader/startup files that requires access to the drive in a pre-boot environment. This will help prevent BitLocker from locking the drive and can avoid a lengthy decryption process.

Suspending BitLocker

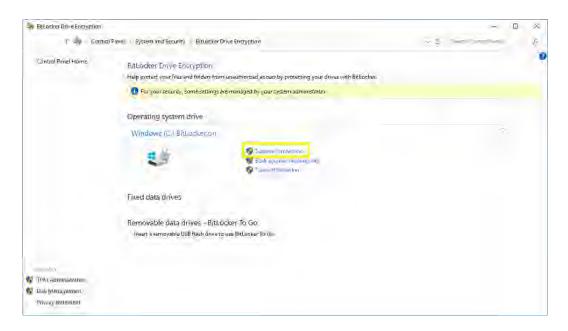
1 Type Manage BitLocker from the Windows search bar to locate the Manage BitLocker Control Panel.



2 Double-click **Manage BitLocker** to open the BitLocker Drive Encryption window.



3 Select **Suspend Protection**.



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A confirmation message "Do you want to suspend BitLocker protection?" displays.



IMPORTANT If you choose to suspend BitLocker, your data will not be protected.

4 If you want to proceed, select **Yes** and the following popup information will display.



If you do not want to proceed, select **No**.

NOTE There are certain situations where you may want to suspend BitLocker such as updating your PC's firmware, hardware, or operating system. If you forget to resume BitLocker after these updates are completed, BitLocker will resume automatically the next time you restart your PC.

Restarting BitLocker Protection

Select Resume Protection.

Recovering Your BitLocker Key

There might be situations where the BitLocker Key is requested from your computer, such as:

- Your drive is placed onto another computer
- Computer requests your recovery key, it may be due to one of the following but is not limited to:
 - Hardware changes
 - Firmware changes
 - Other Windows updates

BitLocker Recovery

1 BitLocker Recovery window will be displayed upon powering on your system.



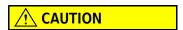
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2 Enter your key from your saved text file or printed copy, then select **Enter**.



3 Windows will reboot your computer.

Protection from Malware Software



The instrument workstation is vulnerable to malware, viruses, and unauthorized access if the instrument PC is connected directly to the laboratory network without installation of all approved OS and malware patches.

IMPORTANT Only the version of the McAfee[®] Application Control (Version 8.3) has been validated to work with the CytoFLEX SRT instrument.

For more information on Configuration of McAfee® Application Control, refer to McAfee® Application Control Guide.

Installing McAfee Application Control

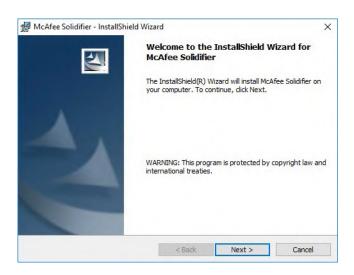
IMPORTANT The McAfee® Application Control Software (version 8.3) which has been proved compatible with the Sorter software, should be purchased separately from McAfee. Download the McAfee® Application Control Software, access McAfee website at www.mcafee.com.

The following procedure can assist you to install the McAfee Application Control software. For more instructions, access the McAfee for help.

Unzip the McAfee Application Control file SOLIDCORxxx_xxx_WIN.zip



 $Right\text{-}click \textbf{ Setup-win-8-10-2012-amd64-xxx.exe}, and select \textbf{Run as administrator}. The \ McAfee$ Installer opens.

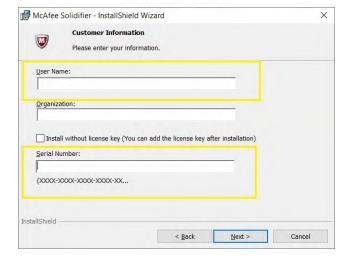


3 Select **Next**. The License Agreement displays.



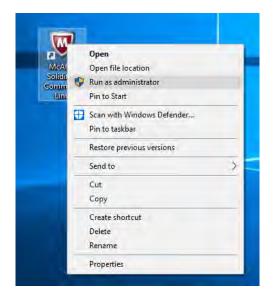
Read the license agreement and select I accept the terms in the license agreement, then select Next.

4 Enter the username and the serial number.



If you select **Install without license key**, follow the procedures below to add the license key after the installation.

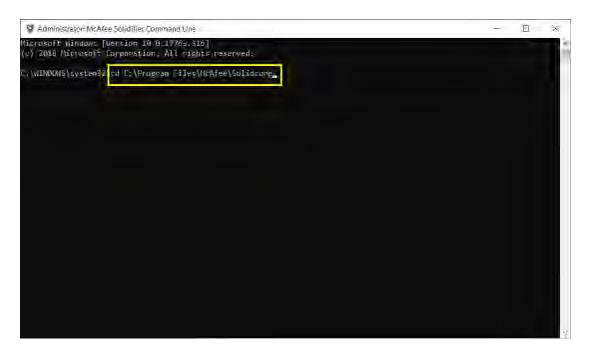
a. Right-click solidifier... on your desktop, and select **Run as administrator**.



The following window displays.



b. Enter cd C:\Program Files\McAfee\Solidcore.



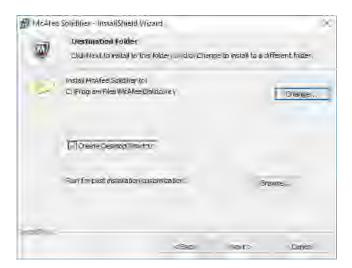
c. Enter the license key in the console.

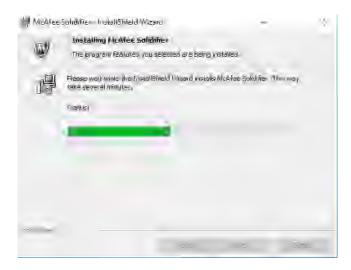


The license key is added.



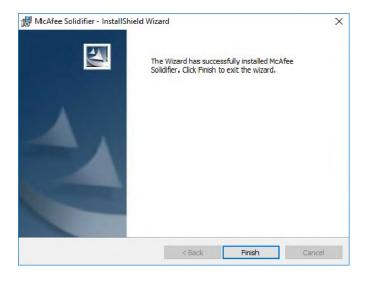
5 Select Next.





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6 Select the destination folder and select **Next**. The system starts to install McAfee Solidifier.



7 Select Finish.

Enabling McAfee Application Control

The enabled McAfee® Application Control Software prevents your system from executing unauthorized applications on your instrument workstation.

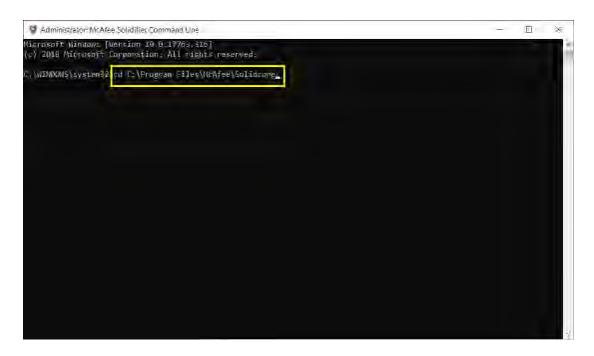
IMPORTANT Ensure all the necessary applications have been installed prior to enabling the McAfee®Application Control.

Right-click on your desktop, and select **Run as administrator**. The following window displays.

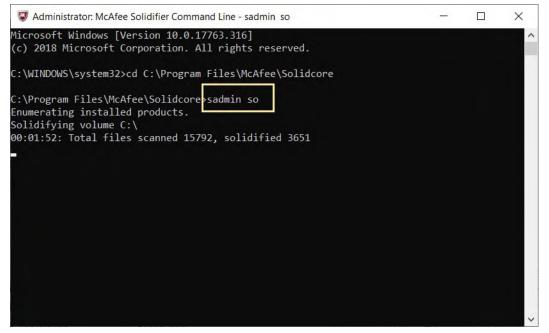


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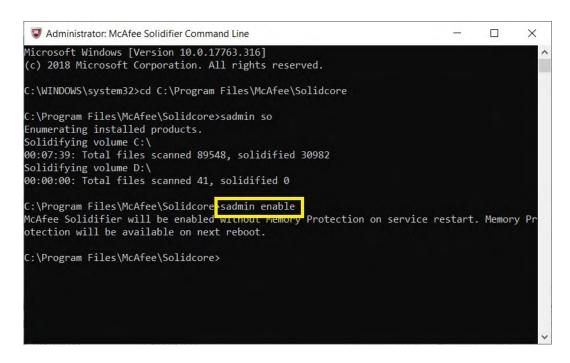
2 Enter cd C:\Program Files\McAfee\Solidcore.



Enter sadmin so in the console to scan the system and create a white list. The solidification process takes about 30 minutes depending on your system size and CPU performance.

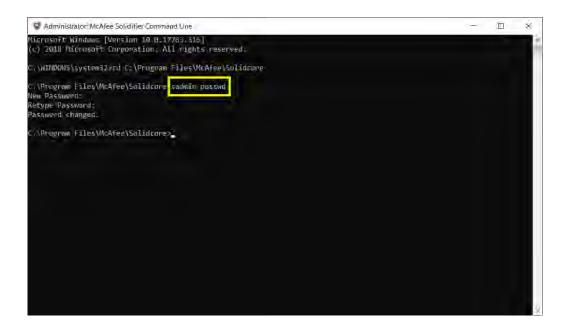


4 Enter **sadmin enable** to enable the McAfee Application Control.



IMPORTANT Beckman Coulter recommends setting a password to manage the authority of enabling/disabling the McAfee Application Control.

5 Enter **sadmin passwd** to set a password to lock the McAfee Application Control authority.



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6 Restart the system.

Exporting the Certificate

Follow procedures below to export the certificate of CytExpert SRT software into your PC.

1 Right-click on the application **CytExpert for xxxx Setup**, and select **Properties**. The following window displays.

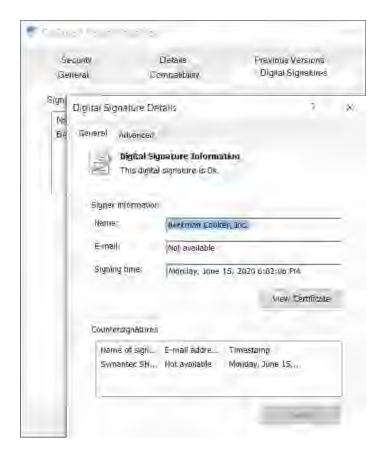


Select the **Digital Signatures** tab. Then select the signature and select **Details** to view the signature information.

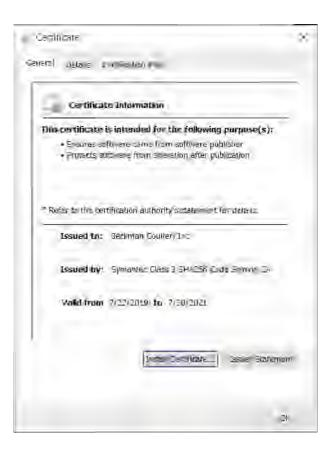


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The Digital Signature Details window displays.



3 Select View Certificate.

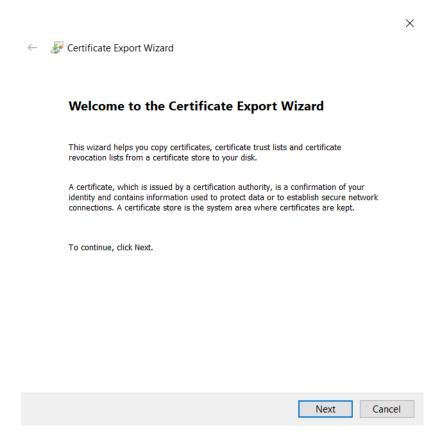


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4 Select the **Details** tab and then select **Copy to File**.



The Certificate Export Wizard window appears.

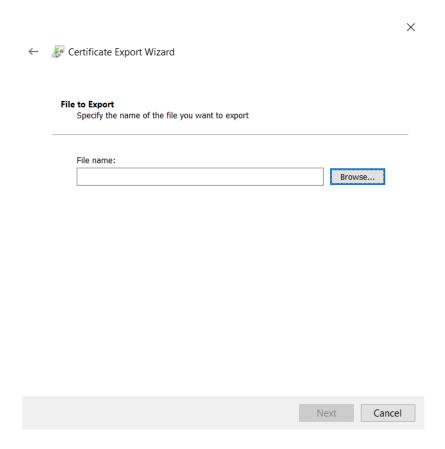


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5 Select **Next** to export the certificate.

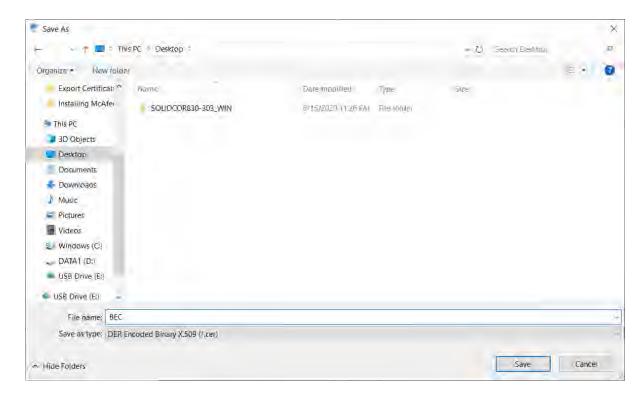


6 Select Base-64-encoded X.509 and then select Next.

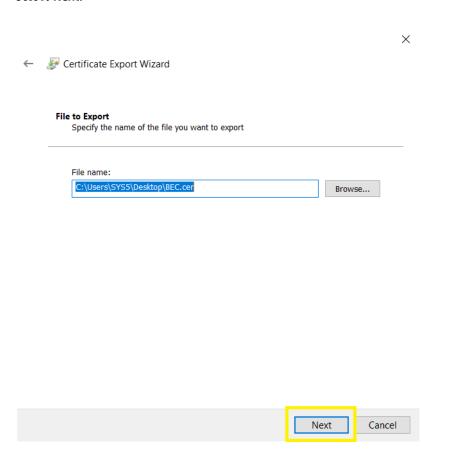


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7 Select a destination to save the certificate and then select **Save**.



Select Next.



9 Select **Finish** when the success message displays.



Importing BEC Certificate

Follow the procedures below to add the certificate of CytExpert SRT software into the McAfee Certificate list. All the certified applications will be regarded as trusted and authorized by the McAfee Application Control.

IMPORTANT McAfee Application Control recognize only X.509 certificates.

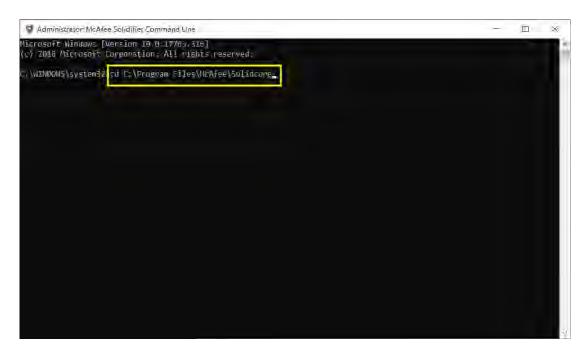
1 Copy the certificate BEC.cer from the CytExpert SRT software disk into your instrument PC.



Right-click McAfee on your desktop, and select **Run as administrator**. The following window displays.

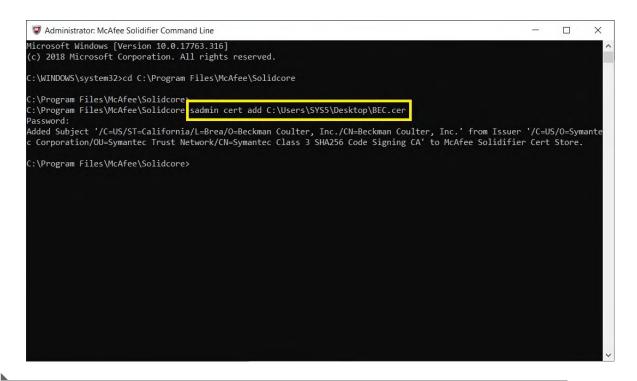


3 Enter cd C:\Program Files\McAfee\Solidcore.



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4 Enter sadmin cert add C:\BEC.cer to add the certificate.



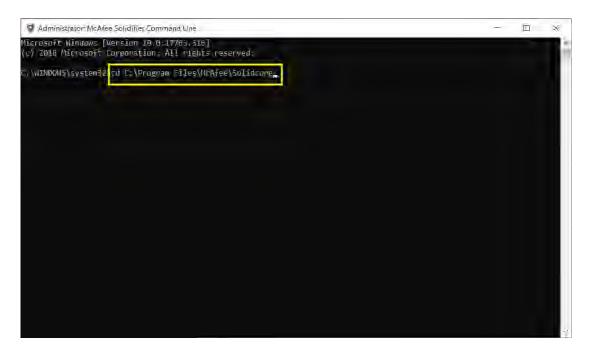
Switching McAfee Application Control to Update Mode

The update mode allows the McAfee Application Control to scan the instrument workstation and add the newly-installed application into the white list automatically. Switch the McAfee Application Control to the update mode when you execute scheduled or emergency changes on your instrument workstation.

Right-click solutifies on your desktop, and select **Run as administrator**. The following window displays.

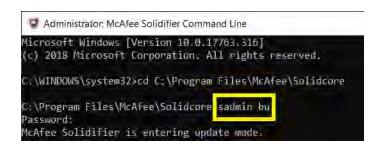


 $\label{eq:cdc:program} \textbf{E} \textbf{ Inter cd C:\Program Files\McAfee\Solidcore}.$

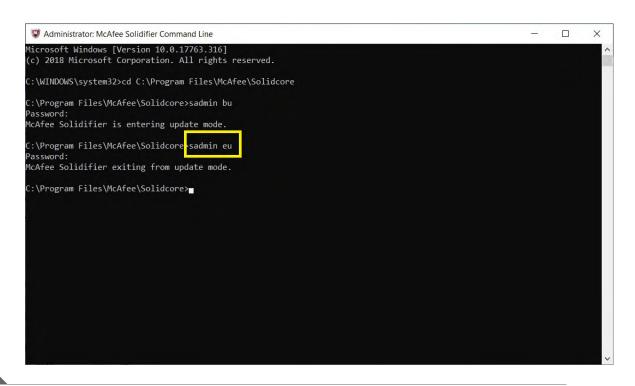


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3 Enter **sadmin bu** to switch the McAfee Application Control to Update Mode.



- **4** Execute scheduled or emergency changes, patch installations, or software updates for your instrument workstation.
- 5 Enter sadmin eu to exit the Update Mode.



Disabling McAfee Application Control

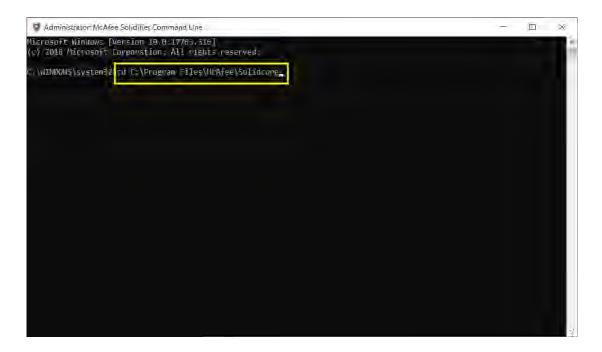
IMPORTANT Disabling McAfee Application Control is a temporary method in special cases, for example, Windows or firmware changes. This will help stop McAfee Application Control from blocking unauthorized applications. Beckman Coulter recommends enabling the McAfee Application Control in most cases.

All the applications installed in this mode will not be included in the McAfee white list.

Right-click solutifies on your desktop, and select **Run as administrator**. The following window displays.

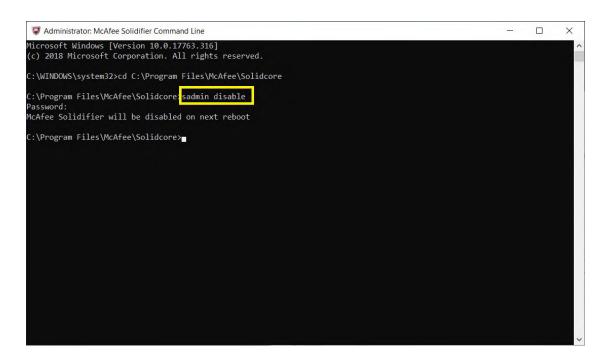


 $\label{eq:cdc:program} \textbf{Enter cd C:\Program Files\McAfee\Solidcore}.$



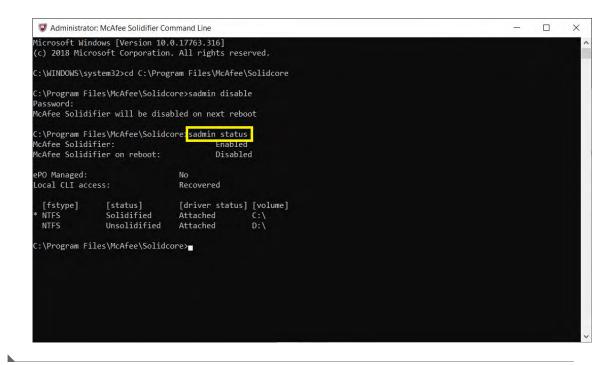
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3 Enter **sadmin disable** in the console.



- 4 Select Enter.
- **5** Restart the System.

6 Enter **sadmin status** to view the status of McAfee Application Control.



Operating System Updates

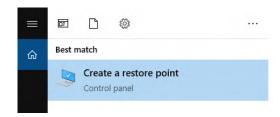


Risk of software incompatibility. Only operating system updates posted to the Beckman Coulter website should be installed on the instrument controller PC. Do not install patches from any other source.

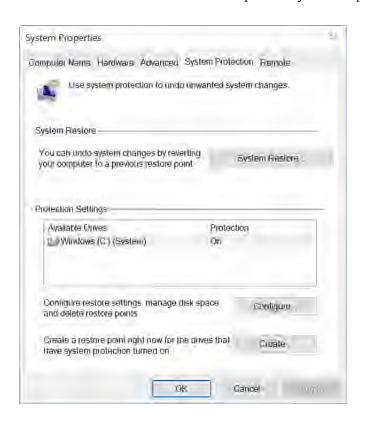
Install the update on one instrument and verify functionality before installing on other instruments.

Enabling System Protection

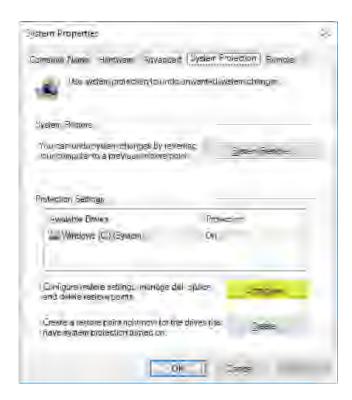
1 In the Start Menu, type **Restore** to locate the **Create a Restore Point**.



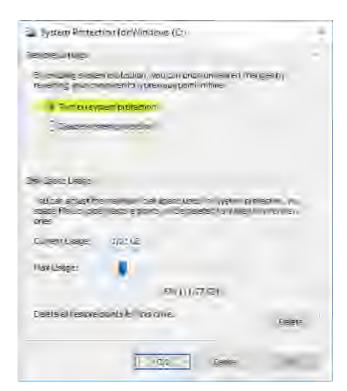
2 Double-click **Create a Restore Point** to open the System Properties window.



3 Select Configure.



The following window appears.

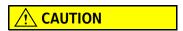


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- 4 Select Turn on system protection, then select Apply.
- **5** Close the System Properties window by selecting **OK**.

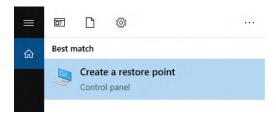
Creating a Restore Point

A restore point is used to remove all software and update installations that occurred after it was created. If installing an update on your PC causes any loss of functionality, the restore point can be used to place the system back into the operable state present before the update installation. In all cases, a system restore with any restore point would not cause loss of any data (i.e. LMD files) on the system.



Risk of unexpected software modification. To ensure a system recovery point is available that is indicative of the most recent software configuration, the user should create a system restore point immediately prior to running the operating system update installer. Otherwise, a user would need to utilize the most recent automatically created restore point which might be up to 72 hours old and not include all recent software modifications.

1 In the Start Menu, type **Restore** to locate the **Create a Restore Point**.



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System Properties Computer Name Hardware Advanced System Protection Remote Use system protection to undo unwanted system changes. System Restore You can undo system changes by reverting System Resions your computer to a previous restore point Protestion Settings Available Utives Protection (C) (System) On Configure restore settings, manage disk space. Configure and delete restore points Create a restore point right now for the drives that Cicale have system protection turned on

2 Double-click Create a Restore Point to open the System Properties window.

Type a name for the restore point and select **Create**.

OK.

Cancel

- 4 Wait for the restore point creation to complete and then select Close.
- **5** Close the System Properties window by selecting **OK**.

Downloading Operating System Updates

In order to download and install operating system updates, you will need to access the Beckman Coulter website at www.beckmancoulter.com.

IMPORTANT Account registration is required for new users.

1 Go to www.beckmancoulter.com.

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- 2 Using the menu bar in the in the upper right hand corner of the screen, hover over **Login**, then scroll down to select **Software Downloads**.
- **3** To search by product:
 - a. Select Research & Discovery from the Market Segment drop-down menu.
 - **b.** Select **Flow Cytometry** from the Product Line. drop-down menu.
 - **c.** Select **Instruments** from the Product Series drop-down menu.
 - **d.** Select **CytoFLEX SRT** from the Product drop-down menu.
- 4 Select Search.

IMPORTANT Print out the Release Notes for each update as they will not be available when the next update is released. The Component Name section of the release notes identifies the Microsoft updates that are included in the download. This information may be requested by your IT team and will be needed to recover from a failed update.

5 Each operating system update is cumulative and only the most recent validated set of updates will be available for download. Select the first file in the results to view the release notes and then select **Download**.

If more than one update is listed in the search results, select search update.

If the operating system updates cannot be not downloaded directly to the instrument controller system, transfer the downloaded files via an encrypted external media or secured network drive to the instrument controller PC.

Notification Options

To receive notification when a new operating system update is validated and available for download, you must sign up for an account on www.beckmancoulter.com and follow the procedure for setting up subscriptions.

Sign up for subscriptions as outlined below:

- Select the **Document Language** consistent with your IFU language.
- Select **Research & Discovery** from Market Segment.
- Select Flow Cytometry from Product Line.
- Select **Instruments** from Product Series.
- Select CytoFLEX SRT from Product.

If you do not sign up for product notifications, you will have to check periodically for newly released operating system updates, see Downloading Operating System Updates.

NOTE Beckman Coulter will only validate and post updates for Windows 10 LTSC 2019.

Installing the Operating System Updates



Risk of software incompatibility. Beckman Coulter can only support operating system updates on unmodified systems. Application of domain policies or other configuration changes may impact compatibility.

IMPORTANT If more than one update is available for your product, install the updates in the order indicated by the sequence number as outlined in the file naming convention below.

RSU- <operating system>--<Year><Month>_<Sequence #>

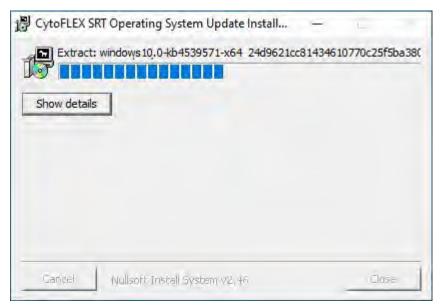
Example: RSU-W10LTSC-CytoFLEX SRT-2020Jun_1_0

- 1 Ensure you have a recent copy of your BitLocker key, refer to Backing Up Your Recovery Key.
- 2 Login to Windows as a user with Administrator access.
- **3** Close all program and save open files.
- **4** Power down the instrument.

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Open the first operating system update file (For example: RSU-W10LTSC-CytoFLEX SRT-2020Jun_1_0) on the Instrument Controller PC by double-clicking on the file. If the Microsoft Windows Defender Smart Screen prompt appears, select **More Info** and **Run Anyway** to launch the installer. This process may take several minutes. See Figure E.7.

Figure E.7 Security Update Setup Installing



NOTE The security update installer will automatically detect and install only the necessary updates.

Once the operating system update setup has completed, select **OK** to restart the system and complete the update process. See Figure E.8 and Figure E.9.

Figure E.8 Security Update Setup Successfully Installed

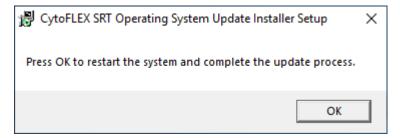
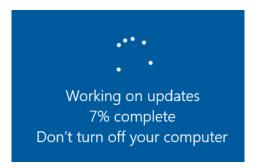


Figure E.9 Windows Shutdown



7 Wait while the system completes the installation of the security updates. This process may take several minutes and will return you to the Windows login screen. See Figure E.10.

Figure E.10 Working on Completing Security Updates



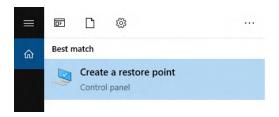
- **8** Install any additional downloaded operating system updates (sequence numbers above 1) by repeating steps 4 to 6.
- **9** Verify functionality of instrument software before installing operating system updates on any other system. If functionality is impaired, see Recovering from Failed Operating System Updates.

Recovering from Failed Operating System Updates

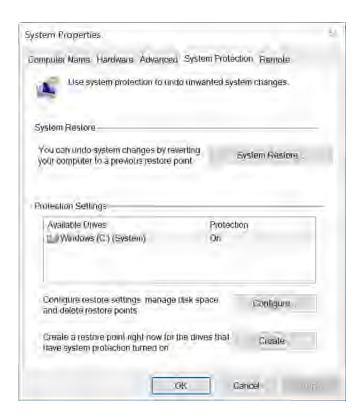
These steps below should only be followed if the instrument software or operating system functionality is impaired after an operating system update was applied.

- Power down the instrument and close all programs. Do not turn your workstation off.
- 2 In the start menu, type view update and select View your Update History.
- 3 Select Uninstall Updates.
- 4 Highlight the update listed under Microsoft Windows that matches the cumulative security update KB number in the release notes. Refer to Component Name section of the Release Notes, see Step 5, Downloading Operating System Updates.
- Select **Uninstall** and select **Yes** when prompted to verify the uninstall. This process may take several minutes to complete.

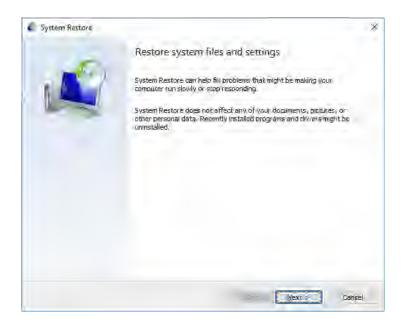
- **6** When prompted to restart, select **Restart Now**.
- 7 Once the PC has been rebooted, login and verify Microsoft update has been removed by repeating Steps 2 and 3. Verify the KB selected in Step 4 is no longer listed.
- **8** Power on the instrument and verify restored software functionality.
 - If software functionality has been restored, continue using your instrument without the update installed. Contact us for troubleshooting the update incompatibility. Do not proceed to Step 9.
 - If software functionality has not been restored, continue to Step 9.
- **9** In Start Menu, type **Restore** and select **Create a Restore Point**.



10 Double-click Create a Restore Point to open the System Properties window.

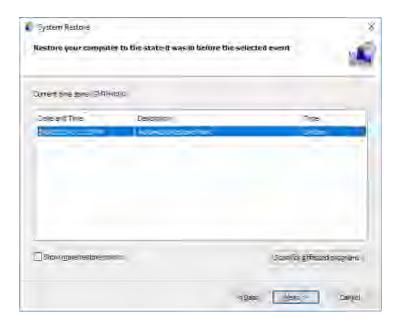


11 Select System Restore. The following window appears.



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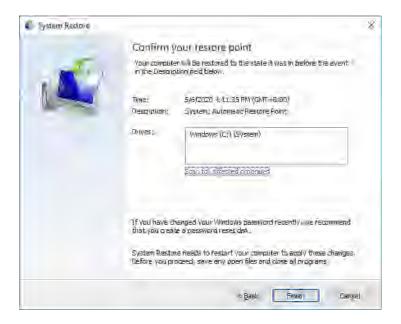
12 Select Next. The following window appears.



! WARNING

Risk of software changes. All software installations and operating configuration system changes that occurred after the selected restore point time stamp will be removed during the restore process.

13 Select the most recent Restore Point and select **Next.** The following window appears.



14 Select **Finish**. The confirm message appears.



15 Select **Yes**. Wait while the system restores. This process takes about several minutes to return to the Windows login screen.

Please wait while your Windows files and settings are being restored System Restore is initializing...

IMPORTANT Operating system updates removed during a restore operation will remain listed on the windows update history screen.

- 16 Log in to the system again and test the functionality of software.
- **17** Contact us for assistance in troubleshooting the update incompatibility or for assistance restoring functionality.

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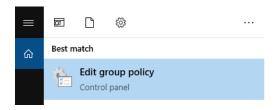
System Hardening

Enabling Automatic Log-Off

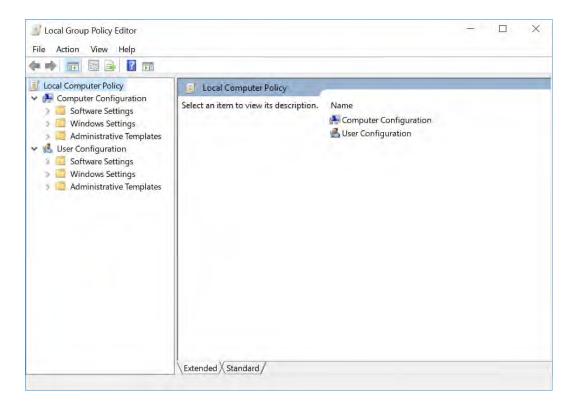
IMPORTANT Automatic log-ff can protect your instrument PC from unauthorized operation when you leave the PC temporarily. Follow the steps below to enable the Screen Saver protection.

Enabling Screen Saver Protection

1 Type Edit group policy from the Windows search bar to locate the Edit group policy editor.

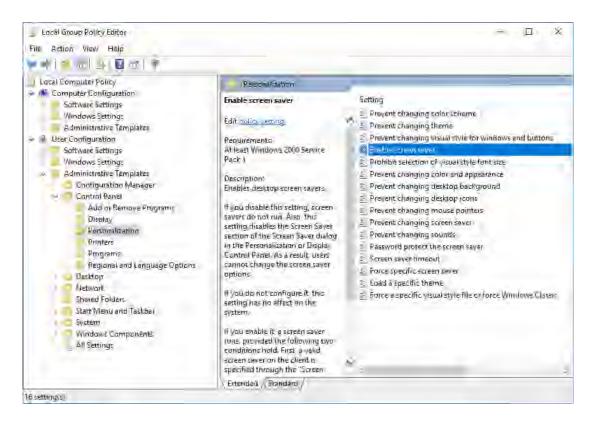


2 Select **Edit group policy.** The Local Group Policy Editor window displays.



C37808AA

3 Navigate to User Configuration > Administrative Templates > Control Panel > Personalization.



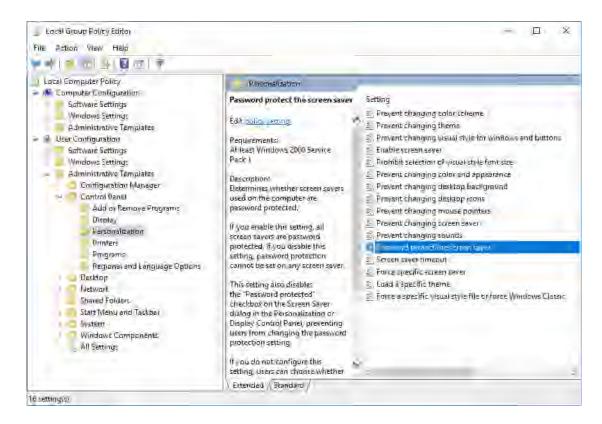
E-66 C37808AA

4 Select **Enable screen saver.** The following window appears.



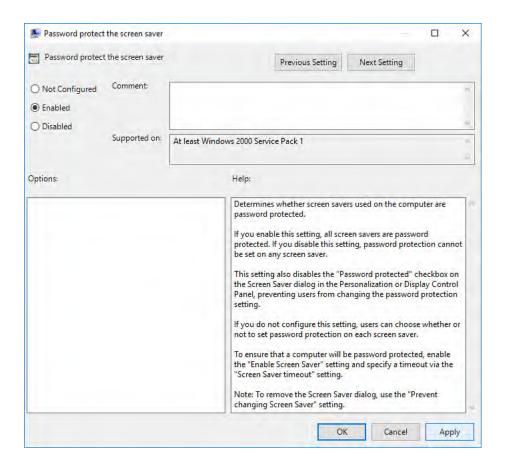
- **5** Select **Enabled** and **Apply**.
- **6** Select **OK** to close the Enable screen saver window.

7 Select **Password protect the screen saver** from the Local Group Policy Editor window.



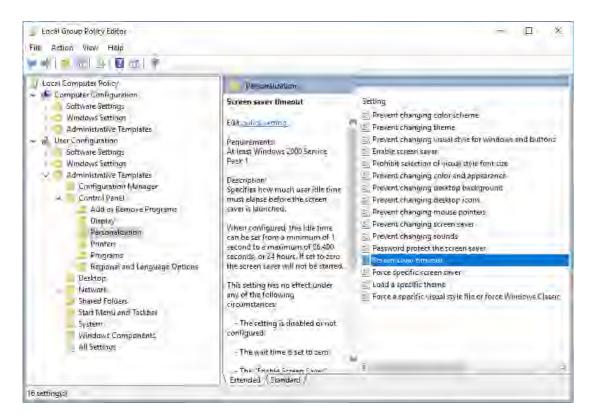
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8 Select Enabled and Apply.



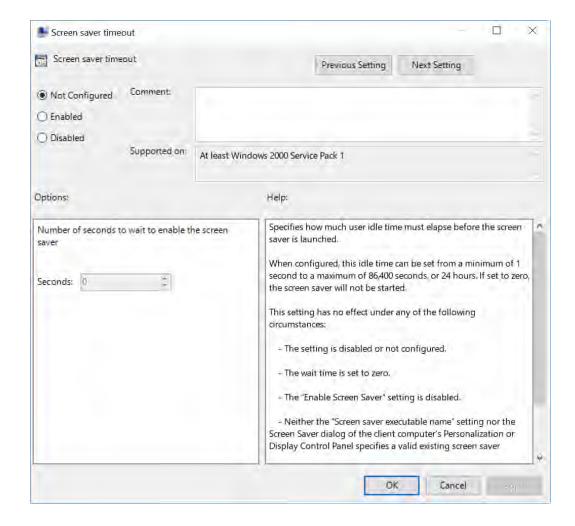
9 Select **OK** to close the window.

10 Select Screen saver timeout from the Local Group Policy Editor window.

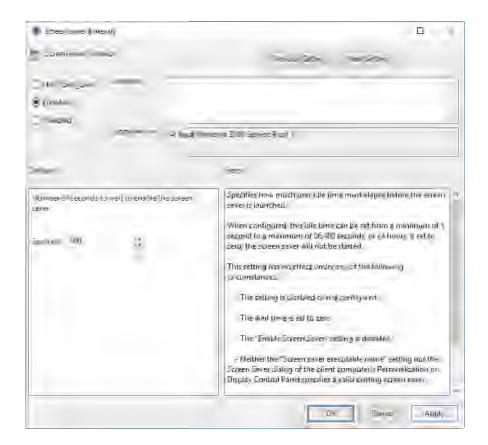


E-70 C37808AA

The Screen saver timeout window appears.



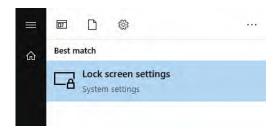
11 Select Enabled and Apply.



12 Select **OK** to close the window.

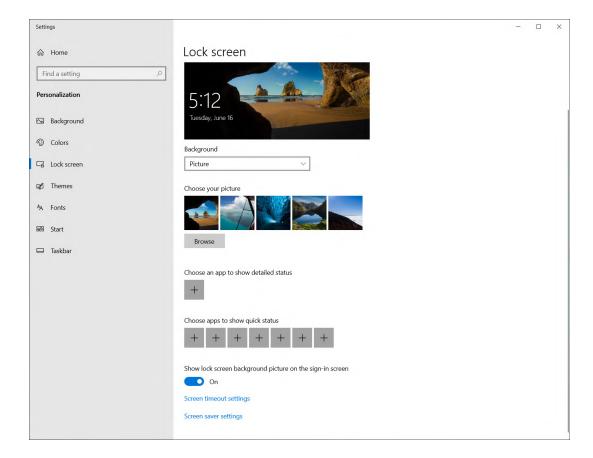
Setting Lock Screen

1 Type Lock screen settings from the Windows search bar to locate Screen saver settings.



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The Settings window appears.



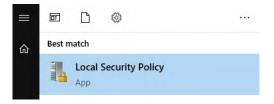
2 Scroll down to the bottom and select **Screen saver settings**. The Screen Saver Settings window appears.



- 3 Select Apply.
- 4 Select **OK** to close the window.

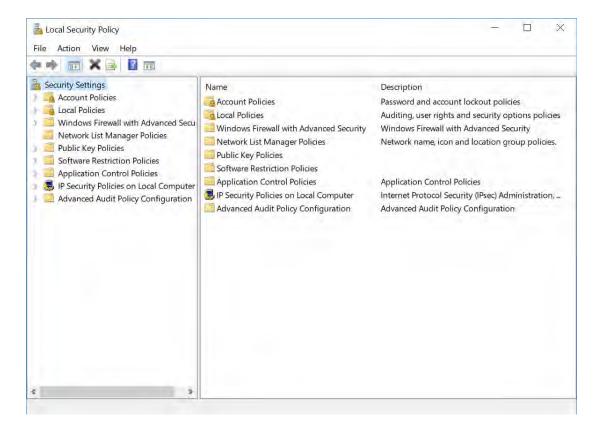
Setting Account Lockout Policy

1 Type Local Security Policy from the Windows search bar to locate the Local Security Policy.

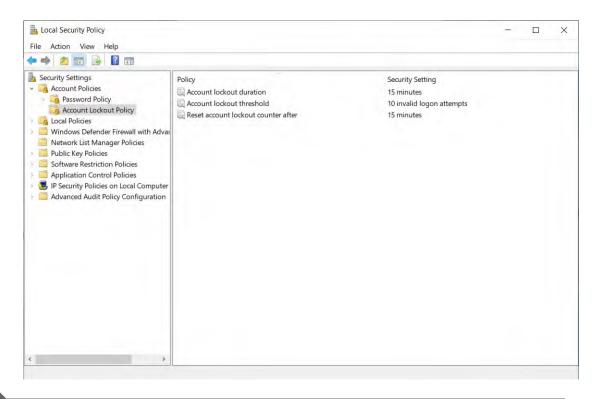


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2 Double-click **Local Security Policy** to open the Local Security Policy window.

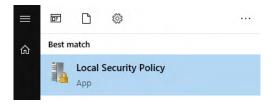


3 Navigate to Security Setting > Account Policies > Account Lockout Policy. Configure the Security Settings as below.



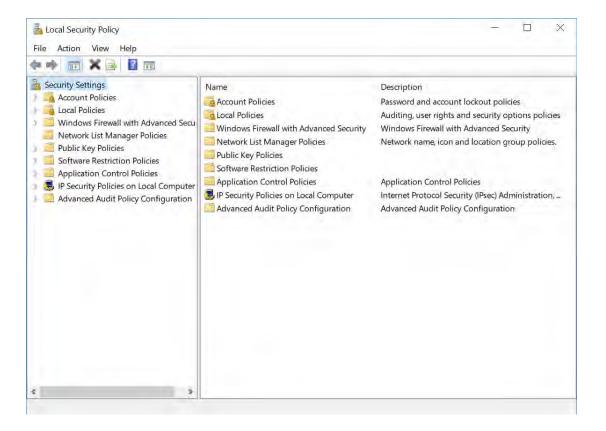
Setting Password Policy

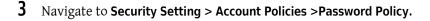
1 Type Local Security Policy from the Windows search bar to locate the Local Security Policy.

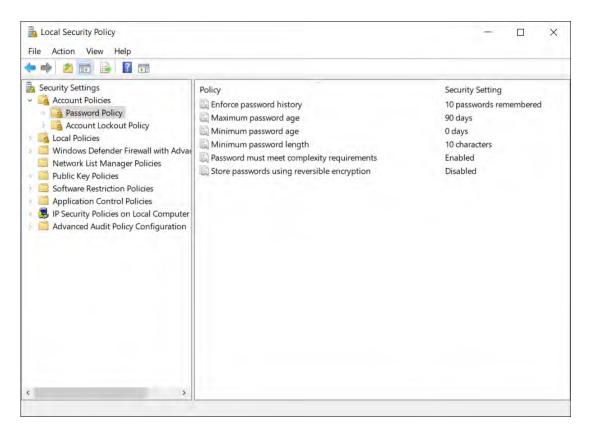


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2 Double-click **Local Security Policy** to open the Local Security Policy window.







- 4 Customize the password policy according to the following.
 - Enforce password history: 10 passwords remembered
 - Maximum password age: 90 days
 - Minimum password age: optional
 - Minimum password length: 10 characters
 - Password must meet complexity requirements: enabled

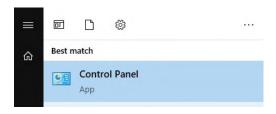
The password must contain all four of the following character types:

- letter in upper case (A -Z)
- letter in lower case (a -z)
- numbers (0-9)
- special character (i.e.,!, @, #, \$,%, ^, &)
- Store passwords using reversible encryption: optional

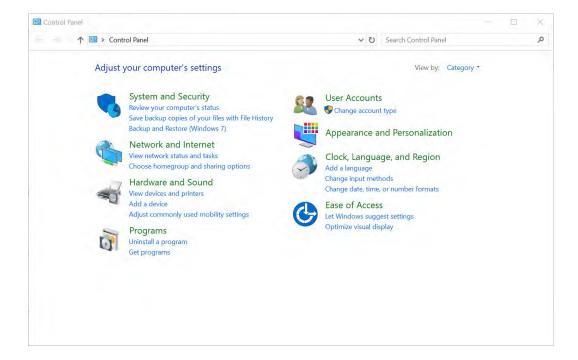
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Disabling Remote Access

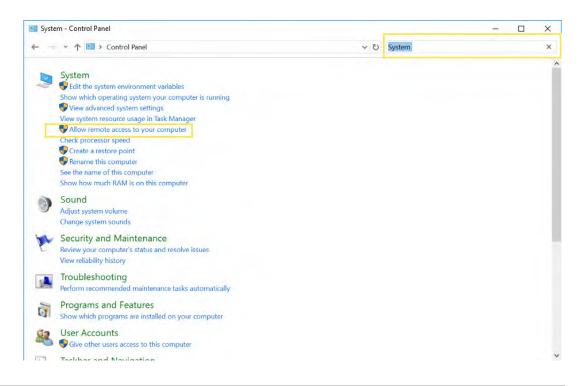
1 Type Control Panel from the Windows search bar to locate the Control Panel app.



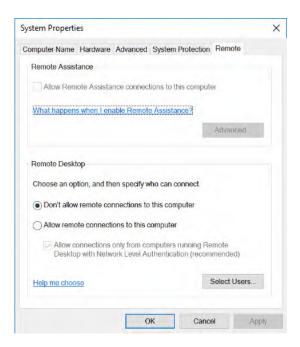
2 Select Control Panel to open the Control Panel window.



3 Type Security from the search bar to locate Allow remote access to your computer.

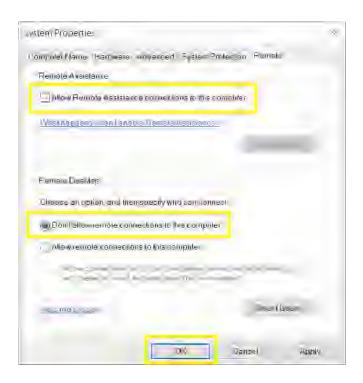


4 Select Allow remote access to your computer. The System Properties window appears.



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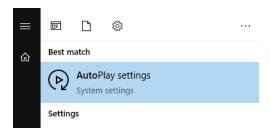
5 Select **Don't allow remote connections to this computer** from the Remote tab.



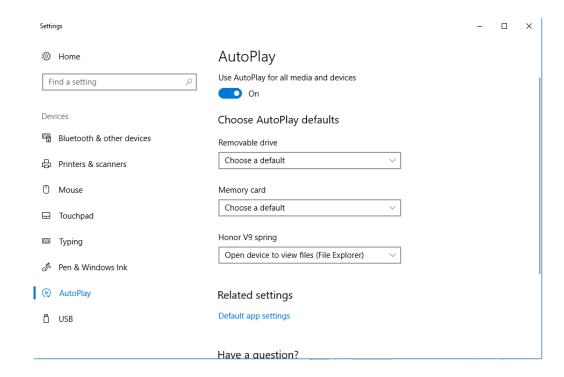
6 Select **OK** to close the window.

Disabling Auto Play

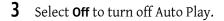
1 Type Auto Play settings from the Windows search bar to locate the Auto Play settings.

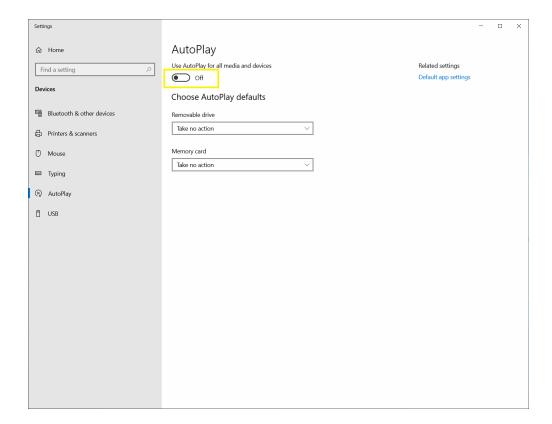


2 Select **Auto Play settings**. The Settings window appears.



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4 Close the window.

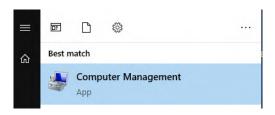
Disabling Unnecessary Services

It is recommended to disable all the unnecessary services while operating the CytExpert SRT software. Refer to Table E.1.

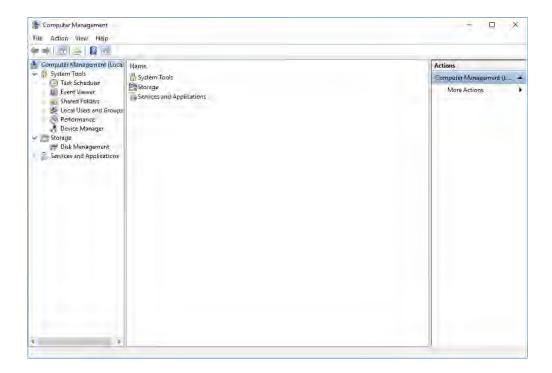
Table E.1 List of Unnecessary Services

Bluetooth Support Service	Microsoft FTP Service (If available)	Windows Media Player Network Sharing Service
Geo-location Service	Microsoft iSCSI Initiator Service	Windows Mobile Hotspot Service
Infrared monitor service	Remote Procedure Call (RPC) Locator	WinHTTP Web Proxy Auto- Discovery Service
Internet Connection Sharing	Routing and Remote Access	Xbox Live Game Save
Link-Layer Topology Discovery Mapper	SSDP Discovery	Xbox Live Networking Service
LxssManager (If available)	UPnP Device Host	

1 Type Computer Management from the Windows search bar to locate the Computer Management App.

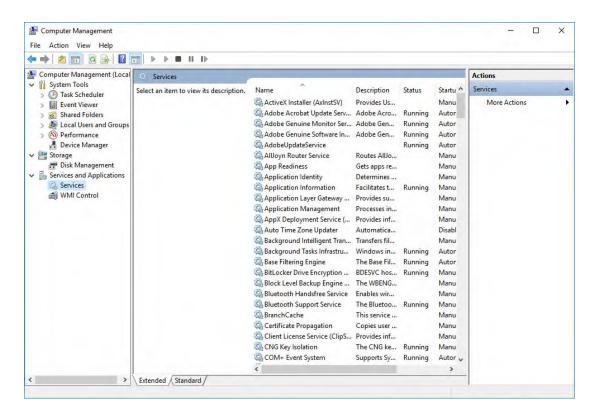


2 Select Computer Management.

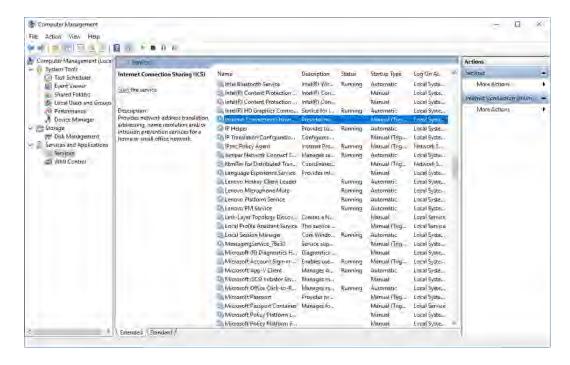


E-84 C37808AA

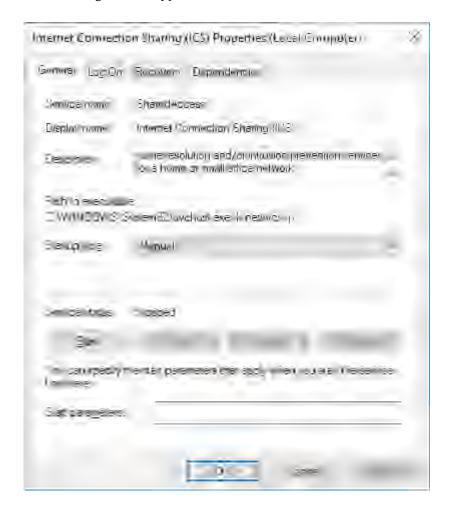
3 Navigate to Services and Applications > Services.



4 Select the service you want to disable.

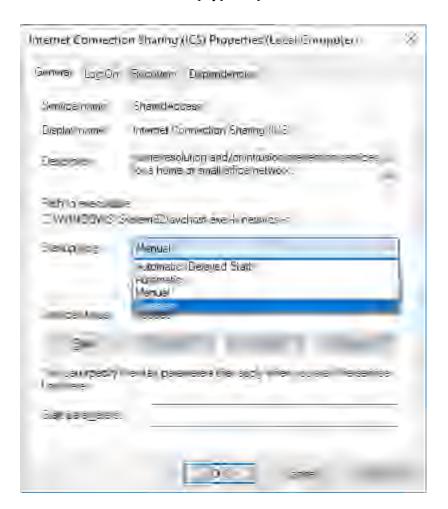


The following window appears.



E-86 C37808AA

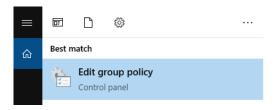
5 Select **Disabled** from the Startup type drop-down.



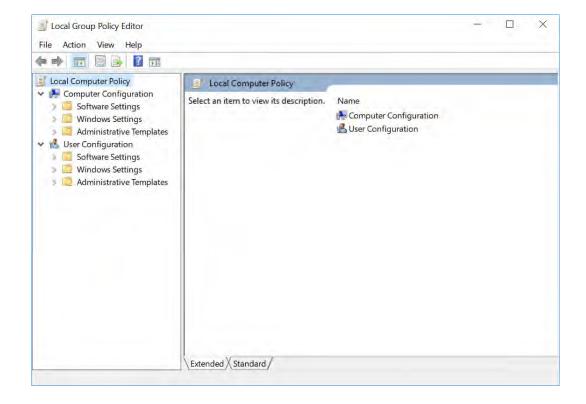
- 6 Select Apply.
- 7 Select **OK** to close the window.

Disabling Unauthorized Applications

1 Type **Edit group policy** from the Windows search bar to locate the **Edit group policy editor** control panel.

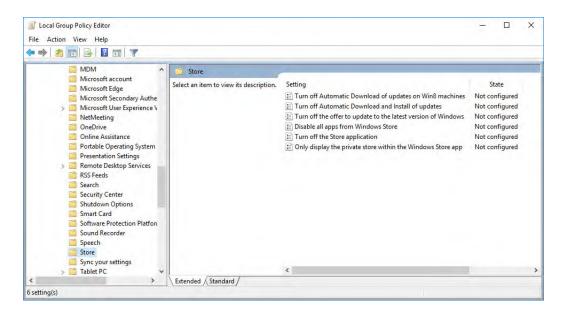


2 Select Edit group policy editor. The Local Group Policy Editor window displays.

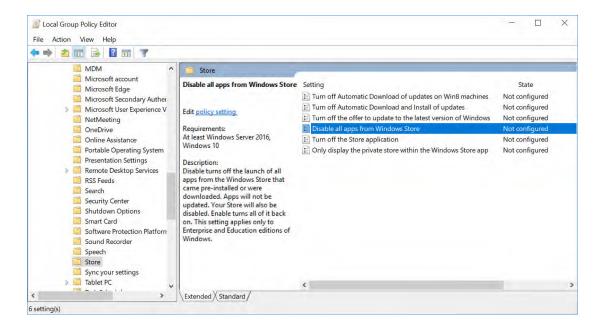


E-88 C37808AA

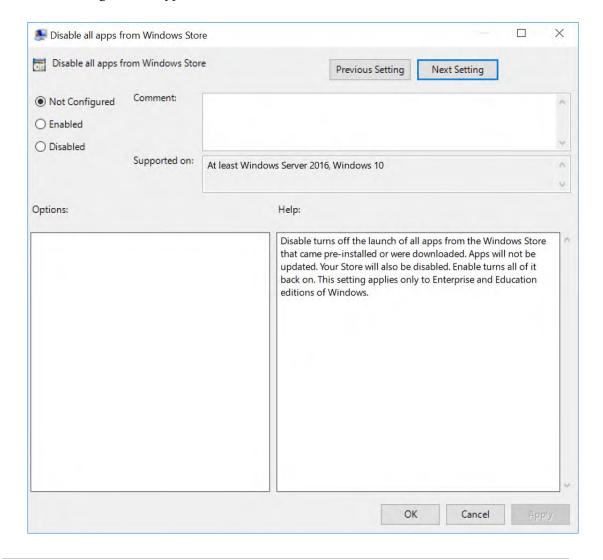
3 Navigate to Computer Configuration > Administrative Templates > Windows Components > Store.



4 Select Disable all apps from Windows Store.



The following window appears.



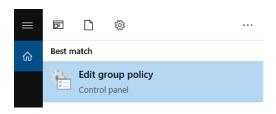
- 5 Select Enabled and Apply.
- **6** Select **OK** to close the window.
- 7 Disable the following applications. Refer to Steps 4-6.
 - Turn off Automatic Download and Install of updates.
 - Turn off the offer to update to the latest version of Windows.
 - Turn off the Store application.

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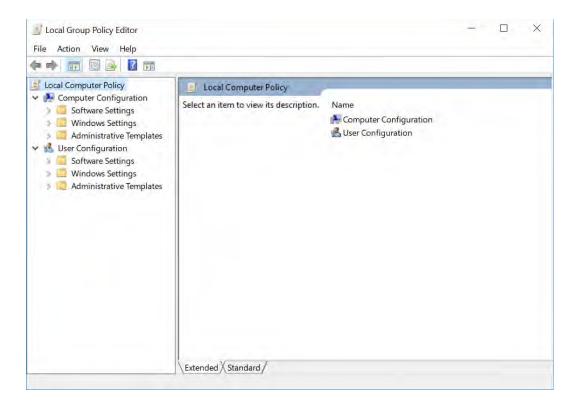
Enabling SMB Digitally Sign Communications

The Server Message Block (SMB) protocol provides the basis for file and print sharing and many other networking operations, such as remote Windows administration. To prevent man-in-the-middle attacks that modify SMB packets in transit, follow the instructions below to enable the SMB Digitally Sign Communications.

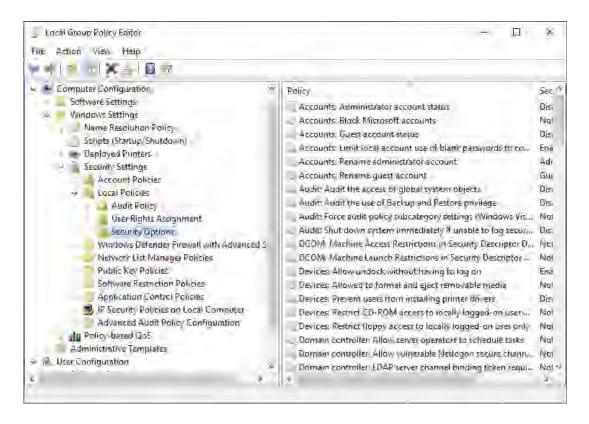
1 Type **Edit group policy** from the Windows search bar to locate the **Edit group policy editor** control panel.



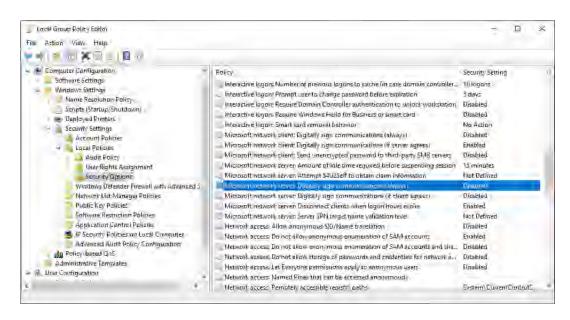
2 Select Edit group policy editor. The Local Group Policy Editor window displays.



Navigate to Computer Configuration > Windows Settings> Security Settings> Security Options.



4 Select Microsoft network server: Digitally sign communications (always).

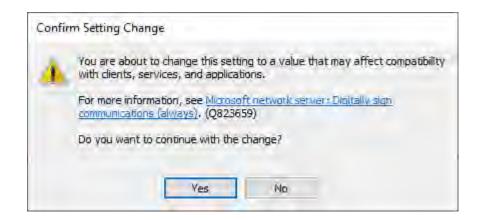


E-92 C37808AA

The following window appears.



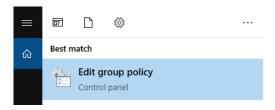
5 Select **Enabled** and **Apply**. The Confirm window appears.



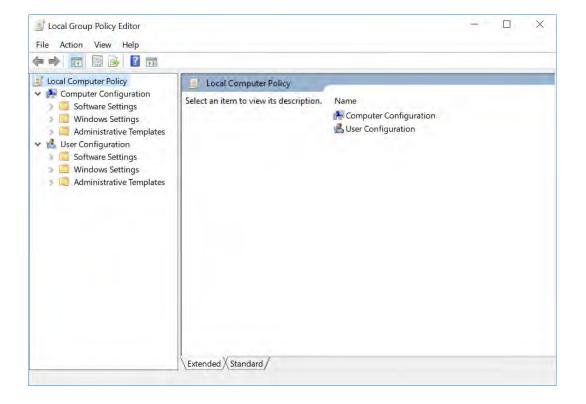
6 Select **Yes.** Then select **OK** to close the window.

Enabling Installation Restriction

1 Type Edit group policy from the Windows search bar to locate the Edit group policy editor control panel.

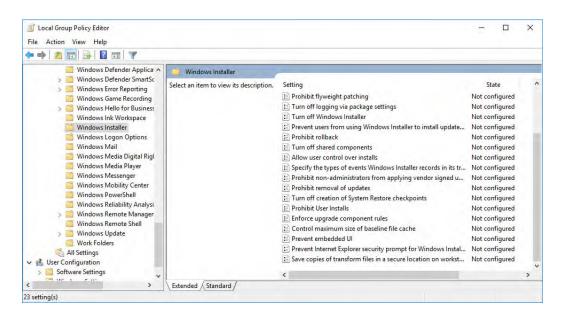


2 Select Edit group policy editor. The Local Group Policy Editor window displays.

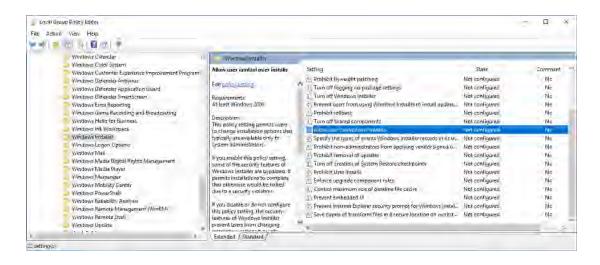


E-94 C37808AA

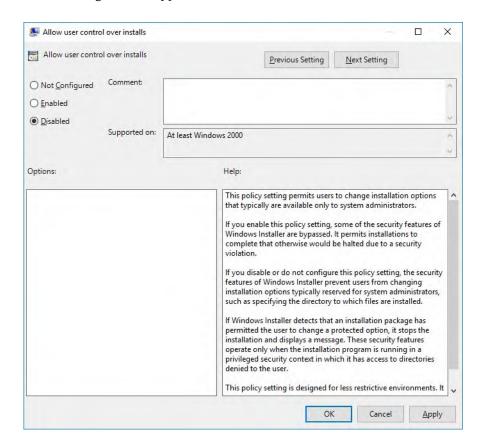
3 Navigate to Computer Configuration > Administrative Templates > Windows Components > Windows Installer.



4 Select Allow user control over installs.



The following window appears.



- 5 Select Disabled and Apply.
- **6** Select **OK** to close the window.
- 7 Disable install with elevated privileges. Refer to Steps 4-6.

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Enabling Firewall Defender

IMPORTANT The Sorter cannot work properly if the necessary network ports are disabled. The communication between the CytExpert SW and the Sorter requires the following network ports to be enabled.

Outbound:

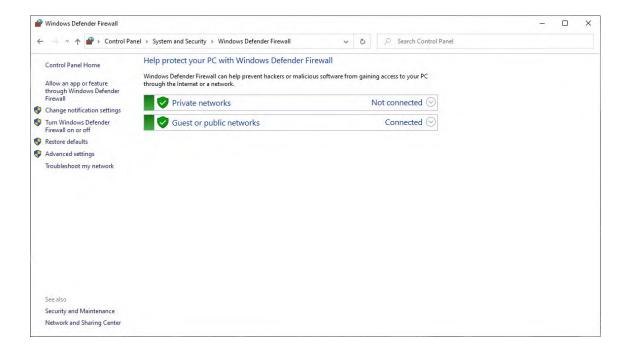
- TCP/192.168.1.155:1501
- TCP/192.168.1.155:1502
- TCP/192.168.1.155:1503
- TCP/192.168.1.155:1510
- TCP/192.168.1.155:60298

Outbound/Inbound:

- TCP/127.0.0.1:1500
- UDP/127.0.0.1:1505
- Type Windows Defender Firewall from the Windows search bar to locate the Windows Defender Firewall app.

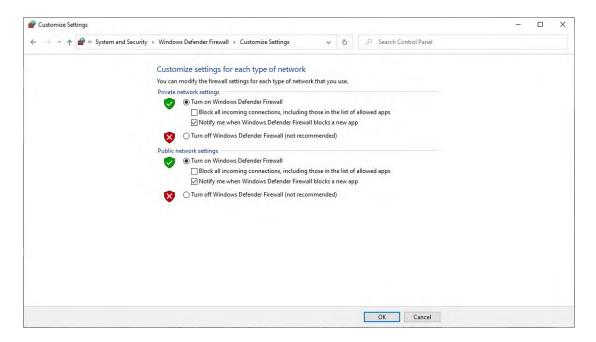


2 Select Turn Windows Defender Firewall on or off.



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3 Select **Turn on Windows Defender Firewall** for both Private network and Public network settings.



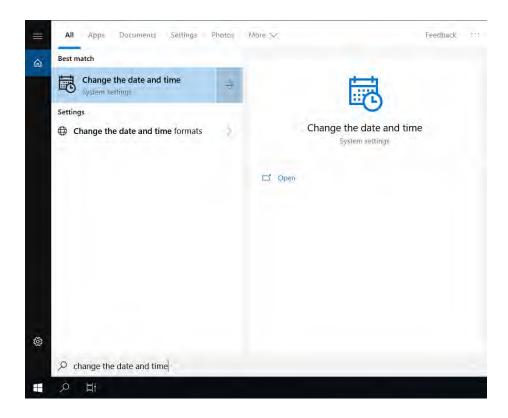
4 Select **o**K.

Enabling Network Time Protocol

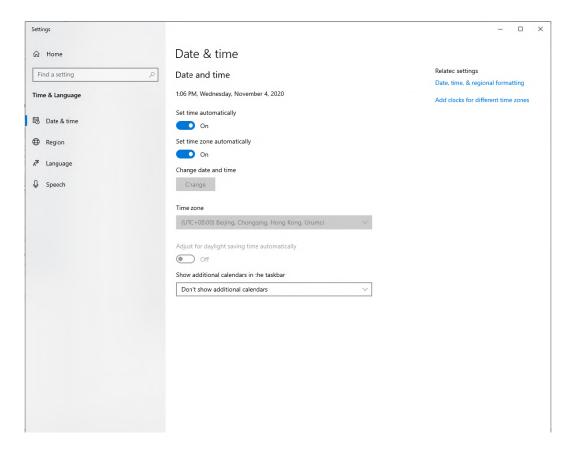
To ensure the accuracy of date and time information included in logs, follow the instructions below to enable the Network Time Protocol.

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1 Type Change the date and time from the Windows search bar.



2 Double-click **Change the date and time**. The Date and Time Settings window appears.



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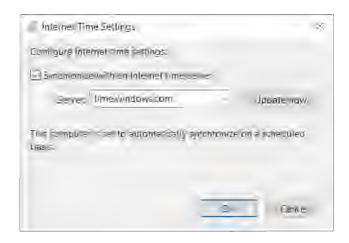
3 Select **Set time automatically** to access the Date and Time window.



4 Select **Change settings** from the Internet Time tab.



The Internet Time Settings window displays.



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5 Select **Synchronize with an internet time server**, and select **OK**. The Sorter PC is set to automatically synchronize with the internet time server.

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Good Practices for Cyber Security System Hardening

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APPENDIX F

Table of Hazardous Substances

Table of Hazardous Substances

The Hazardous Substances Names and Concentration are shown in Table F.1.

C37808AA F-1

Table F.1 有毒有害物质名称及含量的标识格式

Table of Hazardous Substances Name and Concentration [CytoFLEX SRT]

EEP Part Number: C52866	产品名称 Product Name: Cell Sorter 产品型号 Product Model Number: CytoFLEX SRT					
部件名称	有毒有害物质或元素 Hazardous Substances Name					
Component Name	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr ⁶⁺)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板组件 Circuit Boards	Х	0	0	0	0	0
电源组件 Power Supplies	0	0	0	0	0	0
计算机 Computer	0	0	0	0	0	0
功率调节器 Power Conditioner	0	0	0	0	0	0
光量传感器 Optical Sensors	0	0	0	0	0	0
激光 Laser	0	0	0	0	0	0
发动机/泵/阀门/ Motors/Pumps/Valves	0	0	0	0	0	0
电线 Cables	Х	0	0	0	0	0
管路及橡胶 Tubing & Rubber	0	0	0	0	0	0
塑料部件 Plastic	0	0	0	0	0	0
连接部件 Hardware	0	0	0	0	0	0
包装材料 Packing Material	0	0	0	0	0	0

This table is prepared in accordance with the provisions of SJ/T 11364

- 〇:表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572标准规定的限量要求以下
- x: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572标准规定的限量要求
- (企业可在此处,根据实际情况对上表中打"×"的技术原因进行进一步说明)
- O: Indicates that the toxic or hazardous substances contained in all of the homogenous materials for this part is below the limit requirements in GB/T 26572.
- X: Indicates that the toxic or hazardous substance contained in at least one of the homogenous materials used for this part in above the limit requirement in GB/T 26572.

Abbreviations

The following list is a composite of the symbols, abbreviations, acronyms, and reference designators either used in this manual or related to the information in it. When the same abbreviation (or reference designator) is used for more than one word (or type of component), all meanings relevant to this manual are included, separated by semicolons.

ı	_	foot
	_	1001

" — inch

% — percent

°C — degrees Celsius

°F — degrees Fahrenheit

± — plus or minus

< — less than

> — greater than

A — ampere

AC — alternating current

Acq. — Acquisition

APC — Allophycocyanin

APC-A700 — Allophycocyanin-Alexa Fluor™ 700 tandem dye

APC-A750 — Allophycocyanin-Alexa Fluor™ 750

APC-Cy7 — Allophycocyanin-Cyanin 7

API — Application Programming Interface

BCI — Beckman Coulter Incorporated

BMP — bitmap

BP — band-pass filter

CDRH — Center for Devices and Radiological Health

CFSE — carboxyfluorescein succinmidyl ester

cm — centimeters

CSV — comma separated value

CV — coefficient of variation

DD — drop delay

DNA — deoxyribonucleic acid

DW — deep well

ECD — Energy Coupled Dye

EFUP — Environmentally friendly Use Period

EMF — enhanced metafile format

EMR — electromagnetic radiation

EPS — events per second

FAPD — Fiber Array Photo Detector

FCS — flow cytometry standard

FITC — Fluorescein isothiocyanate

FSC — forward scatter

GB — gigabyte

GHz — gigahertz

Gr Wt — gross weight

H — humidity

Hz — hertz

IEC — International Electrotechnical Commission

IR — infrared

kg — kilograms

KO — Krome Orange

LED — light emitting diode

 \leq — less than or equal to

LJ — Levey-Jennings

L — liter

LWH — length, width, height

MB — megabyte

MFI — median fluorescence intensity

MHz — megahertz

min — minute

mL — milliliter

m — meter

mm — millimeter

mW — milliwatt

NaCIO — sodium hypochlorite solution

NaN₃ — sodium azide

NA — numerical aperture

nm - nanometer

Nt Wt — net weight

PB — Pacific Blue™ dye

PC5.5 — Phycoerythrin-Cy[™]5.5 tandem dye

PC5 — Phycoerythrin-Cy[™]5 tandem dye

PC7 — Phycoerythrin-Cy[™]7 tandem dye

PEEK — polyetheretherketone

PE — Phycoerythrin

PerCP — Peridinin-Chlorophyll

PI — Propidium Iodide

PN — part number

PSI — pounds per square inch

QC — quality control

RAM — random access memory

rCV — robust coefficient of variation

RH — relative humidity

RoHS — Restriction of Hazardous Substances Directive

RPTM — real-time messaging protocol

S/N — serial number

SNR — signal to noise ratio

SSC — side scatter

USB — universal serial bus

UV — ultraviolet

VAC — voltage alternating current

VA — volt-ampere

VSSC — violet side scatter

V — volts

WDM — wavelength division multiplexer

W - watts

μL — microliters

μ — micron

 μm — micrometer

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Related Documents

Operating Instructions

PN C37808

- Introduction
- System Overview
- Using the CytExpert SRT Software
- Daily Startup
- Instrument Quality Control and Standardization
- Sorting
- Compensation
- Data Review
- Shutting Down the System
- Troubleshooting
- Cleaning Procedures
- Replacement/Adjustment Procedures
- Approved Cleansers and Disinfectants
- Consumables
- Biosafety Cabinet Accessory
- Instrument Installation
- Good Practices for Cyber Security
- Table of Hazardous Substances
- Abbreviations

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